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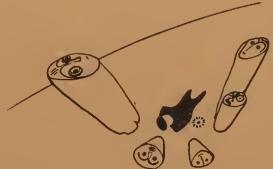
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CALIFORNIA  
DESERT  
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# **Evaluation of Early Human Activities and Remains in the California Desert**

by  
Emma Lou Davis,  
Kathryn H. Brown,  
and Jacqueline Nichols

cultural resources publication  
anthropology-history



## FORWARDS

One of the most popular archaeological subjects is Early Man. The early years of human occupation and use in the New World, generally, and Southern California in particular, have been an intriguing area of investigation for a number of decades now.

Dr. Davis and her colleagues have presented a diverse and revealing set of papers in this volume. The views herein are certainly provocative; sure to bring about lively discussions. There is no doubt that desert researchers and managers will have to give them attention in their work and that the student or layperson will appreciate reading viewpoints less bounded by what some might label as traditional academic conservatism.

The authors are to be congratulated for so candidly expressing their views. Their ideas and convictions, expressed here as a result of a contract providing little funds and a rigid timetable, are a welcome addition to BLM's desert archaeology studies.

Eric W. Ritter  
General Editor

I wish to thank Dr. Davis for this fantastic catalogue of Early Human activity within the California Desert. Recent dates in excess of 200,000 years at Calico do much to substantiate "Davies" claims of ancient pre-Indian antiquity in the California Desert. Ron Keller, Gerry Hillier, Bruce Ottenfeld, and Clara Stapp are to also be thanked for their efforts towards this printed document as is Tracy Cortez for doing some of the more important typing.

Russell L. Kaldenberg  
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EVALUATION OF EARLY HUMAN  
ACTIVITIES AND REMAINS  
IN THE CALIFORNIA DESERT

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It seems to me that

the best  
is yet to come.

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### ABSTRACT

The desert quarter of California lies open for change and/or destruction. This report presents the area's demonstrated wealth of prehistoric information that still is little known, uncorrelated, controversial and fragile. To justify the large sums already expended on archeological surveys of CDCA, it is now essential to create a public document that goes much further. Our research outlines a story of desert prehistory -- the searches of Rogers, the Campbells, Simpson, Begole, Childers, Alsoszatai-Petheo and Davis show that certain desert interfaces contain some of the oldest and richest prehistoric study areas in the New World. These natural laboratories for research must be preserved.



CALIFORNIA DESERTS: THE HUMAN SIDE

"WE WERE CREATED IN THIS DESERT AT AWIKWAMME AND HAVE LIVED HERE FOR ALL TIME. ALL OF THE PLACES WE HAVE STAYED AND LIVED ARE SPECIAL TO US FOR THEY ARE FILLED WITH THE SPIRITS OF OUR ANCESTORS . . . IN OUR LIFESTYLE, AS WE LIVE IT TODAY, ONCE IN A WHILE WE NEED TO GO BACK TO THESE PLACES. THEY ARE REMINDERS THAT WE ARE HUMAN AND THAT THE GREATER SIDE OF US, THE SPIRITUAL SIDE OF US, STILL NEEDS TO BE FED BY SOURCES FROM THE SPIRITUAL WORLD."

CALIFORNIA DESERT  
NATIVE AMERICAN INFORMANT

## DEFINITIONS

E. L. Davis

Provided below are some brief definitions which may aid the reader in interpreting the technical material provided in this text.

### Geoarcheology:

An interdiscipline that combines many sciences in the service of prehistory. Anthropology is only one of these sciences. Geology and climatology are the basics.

### Morfs:

Basic units of form such as "oviate" or "tri-notch."

### Teks:

Basic methods of stone reduction such as "bipolar" splitting, "percussion" or "pressure."

### Macrolith:

A large, simple stone tool characterized by minimal refinement of the original blank.

### Archeolithic:

This term is related to Pleistocene or Paleolithic manifestations of New World cultures that are at present little understood.

## INTRODUCTION

E. L. Davis

The desert quarter of California lies largely open for change and/or destruction. This report presents the area's wealth of prehistoric information that is little known, un-correlated, controversial and fragile: the record of "Early Man." To justify the large sums already expended on archeological surveys of the CDCA, it is now essential to create a public document that goes much further. Our research outlines a story of desert prehistory -- the searches of Rogers, the Campbells, Simpson, Childers, Hunt, Hayden, and Davis. The discoveries of Simpson, Begole, Childers and Alsoszatai-Pettheo show that certain desert interfaces contain some of the oldest and richest prehistoric study areas in the New World. The desert also contains the oldest examples of religious art yet discovered in this hemisphere. These natural laboratories for research must be preserved (see Figure I:1), by setting them outside of commercial, exploitative and recreational areas. All dry lake peripheries, all ancient fan surfaces, all springs should be conserved because they contain early sites, fossil records and ground drawings that are extremely vulnerable to the wheels of vehicles and the spades of looters.

We have here a most exciting part of California history -- a story that has not yet been told -- the story of our California Ancestors. These people quarried stone, evolved many sequences of typically California stone tools (some of which would no longer appear familiar) and migrated between lake valley, and uplands as the climatic cycles changed. When lakes filled the valleys, PaleoAmericans camped near the marshes -- and occasionally they killed a mammoth or camel.

The location of this scenario is the California Desert Conservation Area: twelve million acres (roughly twenty-five percent of the entire state) lying east-west between mountain spines of the Sierran and Peninsular Ranges and the Colorado River. Measured from north to south the area extends from Fish Lake Valley on the Nevada State line to the Mexico-U.S. border just south of Pinto Wash (see Figure I:1, a map).

The target of this report is a review and partial articulation of information about human activities that took place in the CDCA some 5,000 years ago or before. The attempt is incomplete because of inadequate time controls, however the report succeeds in presenting a first, correlated overview of "Early Man" archeology in the CDCA. There are also discussions of just how "early" these various people might be and tantalizing hints that their story may go back for scores (possibly hundreds) of thousands of years. The sonic barrier for accredited dates used to be only 4,000 years in Malcolm Rogers' day, however the work of Warren and True (1961) has pushed it back (with immense effort) to 8,000 years. A quantum leap to greater age estimates was achieved almost a decade ago by the chemist Jeffrey Bada with a racemization date of 48,000 years (maximum) for bones of the Del Mar burial. Our work at China Lake has finally produced a date of 42,350 years (see Section III) on two flakes -- sophisticated in technology -- excavated beside a mammoth tooth. This conforms well with Bada's dates.

A major contribution of this report is its Master Chronology shown as Figure I:3. The diagram provides a synoptic view of a techno-chronology at least 40,000 years old and comprising many different technologies ("Teks") for basic mass reduction of different natural morfs such as cobbles, blocks and shims.

It is possible that the California Deserts hold the key for unlocking a door of human prehistory -- behind that door are bits of a fascinating tale. When and how did our species spread from the Old World to the New one long, long ago -- perhaps several hundred thousand years ago? What were these Ancestors doing when they left polyhedral cores on the Calico fan 80,000 to 125,000 years ago? Here is a desert mystery story. Who were the ancestral hunters of a later time (42,000 years ago), who frequented a high shoreline of Pleistocene Lake China? These unknown foragers were making or sharpening obsidian and chert butchering tools beside the remains of a very elderly mammoth. Enamel from the animal's teeth has provided us with a date. What else can be discovered about the PaleoAmericans?

The following questions might occur:

- 1) Who were these Early Humans?
- 2) How long have people been living in the California desert?
- 3) What were they doing and how did they live?
- 4) How did they cope with the change from an Ice Age California to a Desert California?
- 5) What are the problems of dating their sites?
- 6) Can we discover any aesthetic or religious facets of their lifeways?

The following chapters are designed to address these questions from a number of different perspectives.



PROCEDURES

## METHODS OF WORK

E. L. Davis

Work on the California Desert Conservation Area (CDCA) Early Peoples report has been divided into two parts: preparation of sensitivity maps as managerial aids for the CDCA Planning Staff and preparation of documentation that supports and elucidates the maps for managerial and other purposes.

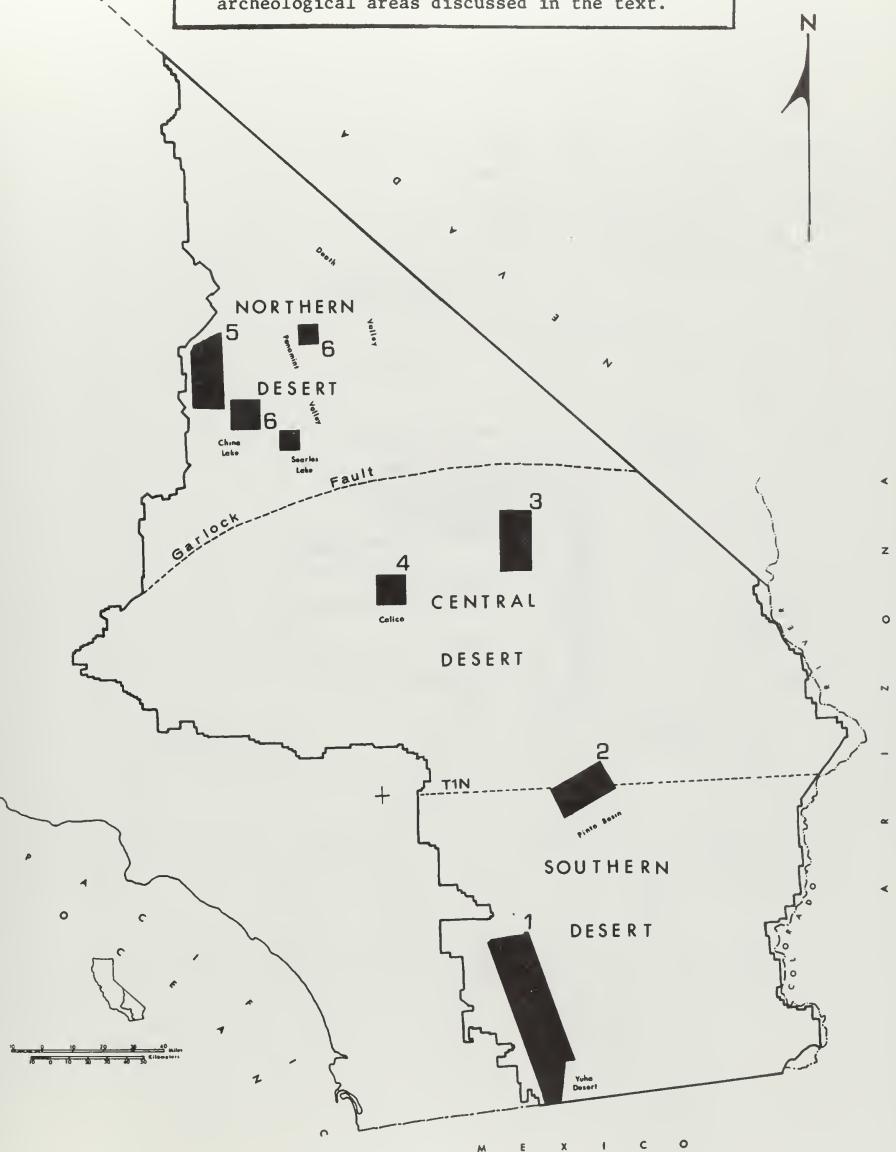
Two maps were made of the southern and northern halves of the California Desert Conservation Area (Figure I:4). Data gathering and recording was carried out between January 3 and March 1, 1979 by Great Basin Foundation Staff members Naomi Wheelock, Nancy Farrell, Elaine Robson and Emma Lou Davis (principal investigator).

In constructing the CDCA sensitivity maps for sites 5,000(?) years or greater in age, several kinds of information were used as follows:

- 1) Actual field work by Davis (1969, 1970, 1974a, 1974b, 1978a, 1978b, 1978c, 1979a, 1979b)
- 2) Archeological record searches of museums and universities (Table 1a)
- 3) Contacts with avocational groups of archeologists (Table 16)
- 4) Search of the literature
- 5) Paleontological work of Fortsch (1972, 1978) at China Lake

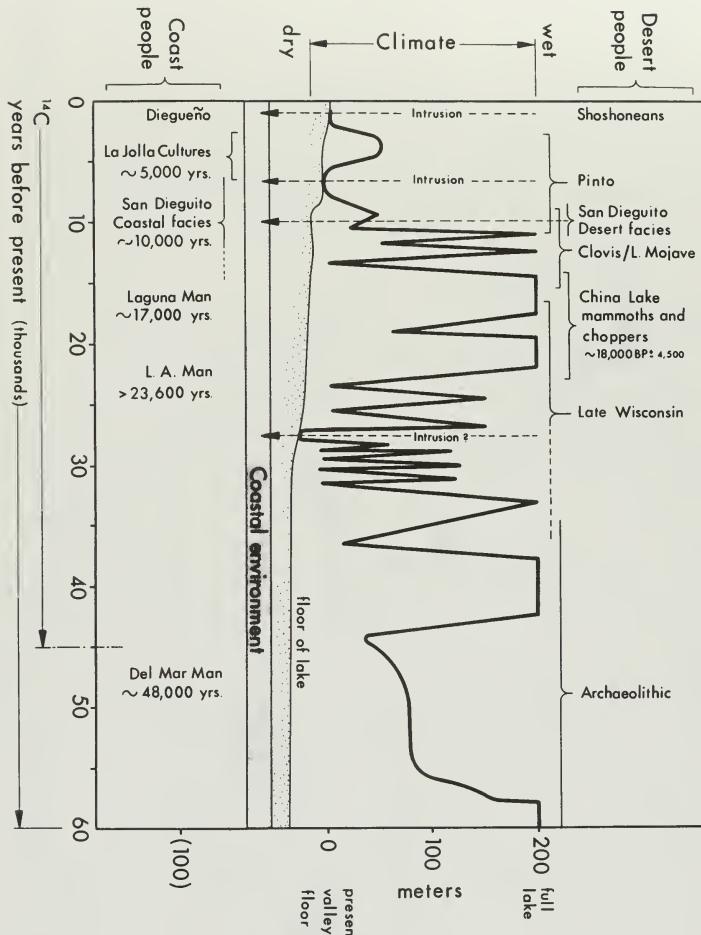
CALIFORNIA DESERT CONSERVATION AREA

Figure I:1. Map of California showing locations of archeological areas discussed in the text.



**Environment / Cultures:** L Searles Base (Smith 1968, 1975)

FIGURE I: 2.



- 6) Actual map-to-map information transferred and provided by the back-country expert observers -- the "desert rats" who love and know these wild landscapes and who have kept their own map records. These people are the true keepers of knowledge and were our best sources of site information. Their maps supplied the data (with their own interpretations) and their hands applied the color coded dots under our supervision (see Table 2, color codes).
- 7) Correspondence with professionals (Table 3 and Appendix A).

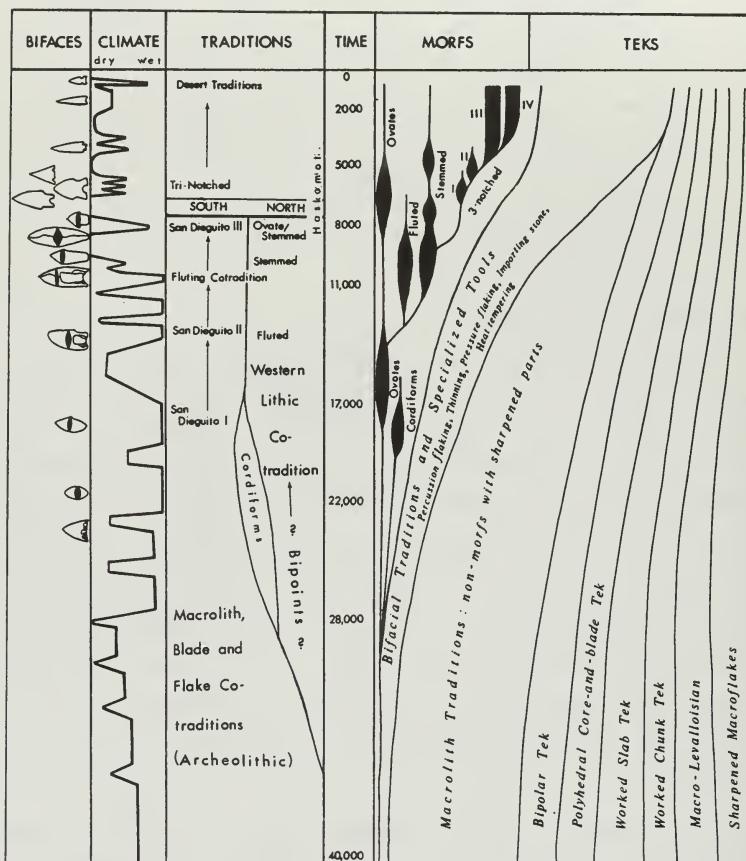
#### The Learned Avocationals

Were it not for the tireless interest and efforts of amateur support, there would have been very little California desert archeology until the past two decades. The deserts were far removed from urban centers and university campuses. Elegant scholars took little interest in getting sunburns and flat tires in the wearying pursuit of stone trash (they thought) made by prehistoric savages whose un instructed efforts could not be worked up into sensational museum displays. Who wants a rock-knocker object made by some unknowable Paleolithoid when, for the same output of energy, one could dig up a gold mask of Agamemnon? So the archeology of California's deserts languished in academic oblivion.

Fortunately, other minds were more inquisitive, more keenly attuned to recognizing both pattern and anomaly in geology, flora and in exotic stones with unexpected

FIGURE I: 3. A chronological system for desert floor archeology in California.

## CDCA MASTER CHRONOLOGY



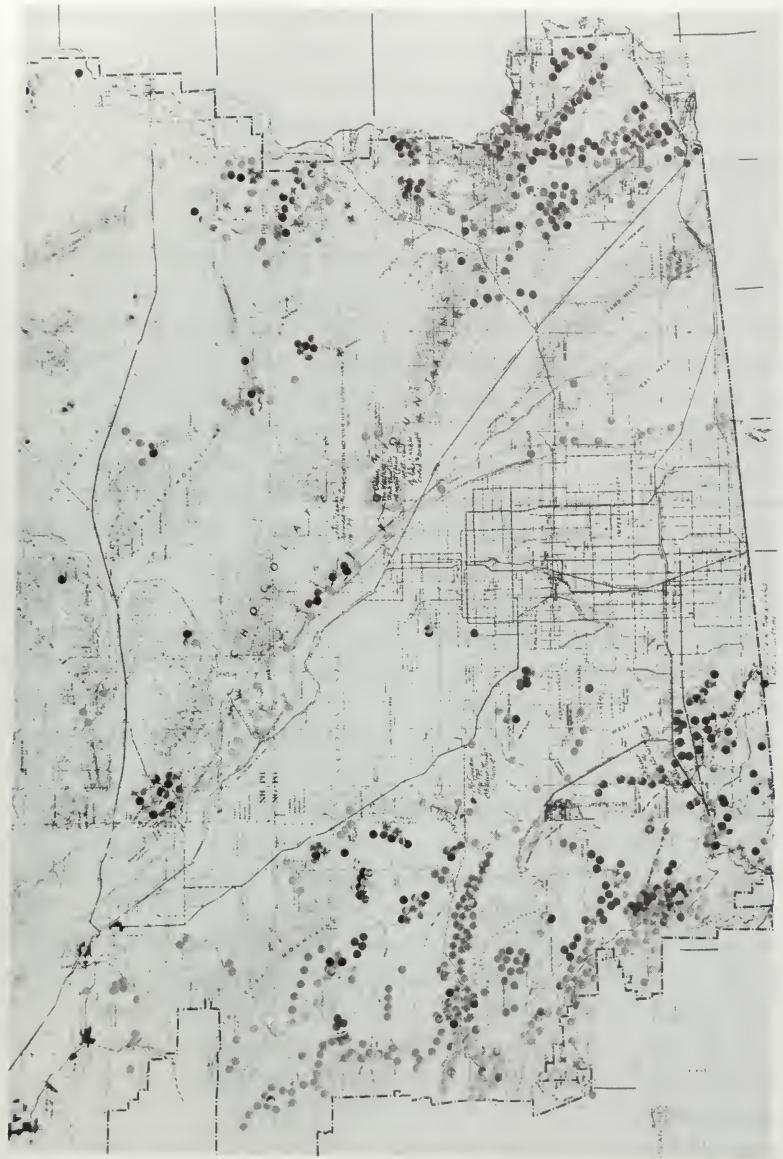


FIGURE 1: 4. Archeological sensitivity map of the southern desert showing site concentrations along shoreline and piedmonts.

attributes and distributions. The first of these alert individuals was Malcolm Rogers who was the curator-director of San Diego's Museum of Man. Rogers, a mining geologist, became a self-taught archeologist (in a sense, a learned vocational) and an excellent ethnographer of southern California remnant groups of Yuman speakers. Malcolm Rogers was the first prehistorian to report sequences of ancient desert artifacts in his "Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas" (1939). He also attempted to model prehistoric seriations for ordering the desert tools in time. Rogers' temporal sequences are discussed in the section on chronologies (Section V, of this report). The scheme comprised a time span of only 4,000 years, beginning with vague "Malpais" cultural remnants, and progressing through San Dieguito, Amargosa and recent Yuman archeological expressions. Rogers' desert observations and his time/people nomenclature provided stimulus and structure for all the first avocational prehistorians of southern California from the coast to the Colorado River.

Therefore, in working with our colleagues who knew the Yuha, Anza-Borrego and Colorado deserts (see Figure I:1) we always began with Malcolm Rogers as square one. Modifications of both time controls and terms have since been developed and will be considered later in this writing.

The next avocationals who set standards and sequences were the Campbells. During the 1930's, William and Elizabeth Crozier Campbell (1931, 1934, 1935, 1936, 1937) did work that was classic for its time in the Mojave Desert, ranging as far north as Little Lake where their work overlapped with that of M. R. Harrington (1957). Both the Campbells and Harrington were allied with and published through the Southwest Museum of Los Angeles. The Campbells,

however, extended their sphere of influence to their home base in Twentynine Palms, greatly influencing avocationals and professionals alike (Warren and de Costa, 1964; Warren, 1967; Warren and Ranere, 1968) and providing a major thrust for foundation of the present Twentynine Palms Visitor Center and museum.

Here again, the Campbell tradition provided a square one and our avocational colleagues from the vast Mojave Desert control areas of the CDCA used the Campbell work as their base for culture-historical concepts and map construction. This created an overprint of Rogers/Campbells' concepts that requires resolution at a higher level of abstraction: a level already addressed by Hester (1973). However, Hester's "Pluvial Lakes Tradition" is too generalized. Refinements based on Smith's work at Searles Lake are proposed (1968, 1977) in this report (Figure I:2, a synthesis).

All these persons, past and present have been remarkable individuals: insightful, physically rugged and independent of spirit. They built rough but sturdy time structures for desert archeology out of some kind of solid oak of the human mind that will always stand as a scientific base however many refinements and corrections may be added.

Therefore, the work of Rogers (Colorado and Southern Mojave Deserts) and the Campbells-Harrington publications (Central and Northern Mojave Desert) were conceptually and terminologically a basis for most avocationals who built the CDCA Sensitivity Maps.

Rogers introduced the concept of widespread, areal sequences of culture history expressed in the San Dieguito and Amargosa series. The Campbells, followed by Harrington, established local manifestations -- such as "Lake Mojave"

and "Pinto" -- that provided form and temporal structure for field work of the avocational investigators who followed.

After the 1930's, little change was made in generally accepted chronologies and systems of naming the phenomena of California Desert prehistory. Much work has since been done (e.g., Hunt, 1960; Smith, 1977; Davis, 1978c), but the influence has not become apparent in avocational thinking. However, at this point it is essential to mention a quantum change in a most basic and hotly contested idea: that human habitation of the New World is of considerable (although as yet unmeasured) antiquity. Carter (1957), Simpson (1972, 1979), and Childers (1974) are the major contributors, followed by Bada (1975) and Bischoff, et al. (1976, 1979).

This concept is hard to prove yet impossible to overlook. The California deserts have natural laboratories like fluvial Pinto Wash and lacustrine lakes China, Panamint and Death Valley (Manly) where erosion exposes cultural materials in ancient deposits. Therefore these deserts should become a nationally supported field for investigations of our cultural antiquity and its one-to-one correlation with climatic change. The theme of this whole report is that these "early man" studies are best pursued by massive investigations of the delicate stratigraphies of the desert catchment basins and streams. We meanwhile acknowledge the major contributions of self-trained, learned and earnest persons. I wish to go on record by calling attention to an important epistemological difference between academic thinking and avocational thinking. Academe is precise, narrow and safely confined. Avocational is less precise but open, creative, exploratory and deeply appreciative. Avocationals like Winslow (1972) (a desert painter) are best able to capture the Spirit of Places that animates California deserts.

These deserts are otherwise a passing dream to be destroyed by wheels, military installations and strip mining.

Therefore we found amateur contributors to be most productive in constructing the two site maps that form a base for this report. The literature is scanty and University Research Facility site reports were glaringly insufficient: most presented "what" but not "where," or the reverse and contributed little to knowledge except a vague impression that "Kilroy was here."

The formal reports of desert surveys, executed in part under contracts with The Bureau of Land Management, are highly imperfect because of their tiny samples (e.g., 0.5% to 2.5%). Nevertheless they will stand as a monument. The efforts toward craftsmanship and consistency provide a corpus of reference material that will make itself felt in the coming decades as legislation and professionalism rapidly cut away the working base of those extraordinary pioneers: THE LEARNED AVOCATIONALS.

In conclusion of this methods section, I wish to make clear a very important point: the avocationals shared a basic weakness in California archeological theory but were not its cause. The weakness is that there is no integrated theoretical structure for tying together the scraps of knowledge that form a corpus for California prehistory. This information is at present ragged, uncorrelated and is based on the flimsy concept of tool-types rather than technological traditions (see "Macrolith Industries of Southern California," Davis, Carter, Minshall and Hardaker in this volume, 1979). It also puts the cart before the horse by assigning primary importance to (tenuous) cultural constructs rather than to the geological/climatic events that really structured the lives of pre-industrial peoples. The basic

flaw in California archeology is therefore an epistemological one. A future task is to correct this theoretical weakness through studies of: a) paleoclimates, b) the geochronologies of lakebeds and seeps that express these paleoclimates; and most importantly c) to emphasize manufacturing traditions of stone tool production instead of this or that subset of shapes. In short, the New Thinking must be built on twin cornerstones: 1) geoarcheology (not tool typing), and 2) Techno-tradition or "teks."

#### Preparation of the Early Site

##### Sensitivity Maps

First, rough copies were prepared with the assistance of avocational, museum, literary and field report information. Each site locus was given a color coded dot of pressure sensitive material as shown in Table 2. However, no background color -- an equivalence of high, medium or low sensitivity to impact -- was added at this time. Figure I:4 shows the map of the extreme southern part of the CDCA (bordering on Mexico), in its preliminary stage of construction with only the coded blips visible. Final versions of the maps had background colors added to indicate areal sensitivity. Three colors were used: pink, blue, and yellow. The color was in a practical and readily available form: the wide, felt, coloring markers used by students to accentuate passages in books. The inks are entirely transparent and apply smoothly. The color hierarchy was:

yellow = highly sensitive

pink = medium sensitivity

blue = low sensitivity

no color = unknown or unimportant

These maps are impressionistic. Information at present is inadequate for quantifying the disparate, individual observations and interpretations that are represented. Nevertheless, however imperfect they may be, these northern and southern maps of the entire CDCA are still unique because of the quantity of sites they make visible. Never before have so many California Desert sites (middle Holocene and Pleistocene in age) been accounted for in a single, synoptic presentation.

In summary neither the "sensitivity-to-destruction" maps nor this rapid-scan report are standard, scientific products. They are preliminary sketches. Remember, with any cultural materials greater than a few hundred years in age, we are picking our way through an uncut jungle. Neither the university "pros" nor the avocational "amateurs" usually define the contents of each site. Warren (1967), Warren and Ranere (1968), Coombs and others (1979a and b) tried very hard to be precise but they were limited by:  
a) working with surface-only collections of others, and  
b) the fact that such collections were uncontrolled, "pick-ups" or were left "in situ." Begole (1973, 1974) and Hayden (1976) have a far better understanding of the nature and significance of "their" sites and site collections. I also know that the China Lake site documentation with plane table and stratigraphic studies is the only way to commence open-desert Paleo archeological studies -- but this work must be pursued much further and backed up with site excavation (Davis, ed. 1978:89-95).

TABLE 1a  
CONTRIBUTORS TO MAPS: ORGANIZATIONS AND TEAMS

San Bernardino County Museum Participants

Bob Reynolds; Ben and Lucille McCown; Chris Hardaker;  
Dee Simpson; John Kelly; Naomi Wheelock; E. L. Davis.

Joshua Tree National Monument Visitor Center Museum  
Participants

Pat Flanagan, Curator; John and Grace Kelly (friends of  
the Campbells); Ritner Sayles; Naomi Wheelock; E. L. Davis.

Imperial Valley College Museum Participants

Jay von Werlhoff; Chris Hardaker; Morlin Childers;  
Naomi Wheelock; E. L. Davis.

San Diego Museum of Man Participants

Curatorial Staff; Clark W. Brott (BLM, Redding, CA);  
Naomi Wheelock; E. L. Davis.

UCLA Archeological Research Facility Participants

Curatorial Staff; William Chewlow; Nancy Farrell

UCR Archeological Research Unit Participants

Curatorial Staff; Nancy Farrell.

CA Department of Parks and Recreation, Anza/Borrego

Robert Begole.

TABLE 1b  
UNAFFILIATED CONTRIBUTORS

Gene Shepard; Jim Benton; Louis Tadlock; Chris Hardaker

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TABLE 2

COLOR CODE USED ON MAPS OF SITES MORE  
THAN FIVE THOUSAND YEARS IN AGE

Type of Site	Color Code	Translation of Symbol (Color)
Quarries -----	●	Blue
Turquoise Mines -----	●	Green
Alignments and Ground Figures -----	●	Gold
Rock Art -----	●	Silver
Bedrock Grinding, Metate Slicks Groundrock Mortars -----	○	Yellow
Camps and Circles (unidentified for culture but est. > 5000 yrs)-----	●	Tan
Caves (w. est. lower levels > 5000 years old) -----	●	Tan w. Central Dot
Lithic Scatter -----	●	Blue w. "X"
Paleontology -----	●	Red (Extinct Animal Bone)

Age of Site

Pre 20,000 BP "Malpais"/San Dieguito I -----	●	Black
Paleoindian 20,000-5,000 BP San Dieguito II -----	●	Tan w. "X"
Lake Mojave/Clovis 11,000-8,000 BP San Dieguito III -----	●	Orange
Early Holocene 10,800-10,000 BP---	●	1/4 Orange 3/4 Black
Mid Holocene 10,000-5,000 BP Silverlake -----	●	1/2 Orange 1/2 Black
Late Holocene 5,000 BP Pinto/Amargosa I -----	●	3/4 Orange 1/4 Black

TABLE 3  
CONTRIBUTORS (general opinions and interpretations  
of "early" sites by letter).

William Chewlow  
R. E. Taylor  
Philip Wilke  
Eric Ritter  
Paul Ezell  
Clement Meighan  
Louis Payen  
Carol Rector  
George Carter  
Robert Laidlaw  
Native American Informant (anon.)  
\*Herbert Minshall  
\*Morlin Childers  
David Weide  
Tilly Barling  
\*Robert Begole  
Robert Bettinger  
Chia Lan-poo (Academia Sinica, Peking)  
Gail Givens  
Russel Kaldenberg  
\*Joan Oxendine  
\*Ruth ("Dee") Simpson  
D. L. True  
\*Jay von Werlhoff  
\*Mr. and Mrs. Ben McCown

---

\*Also assisted in sensitivity map construction.



Levels of Searles Lake. (After Smith 1968; 1977.)

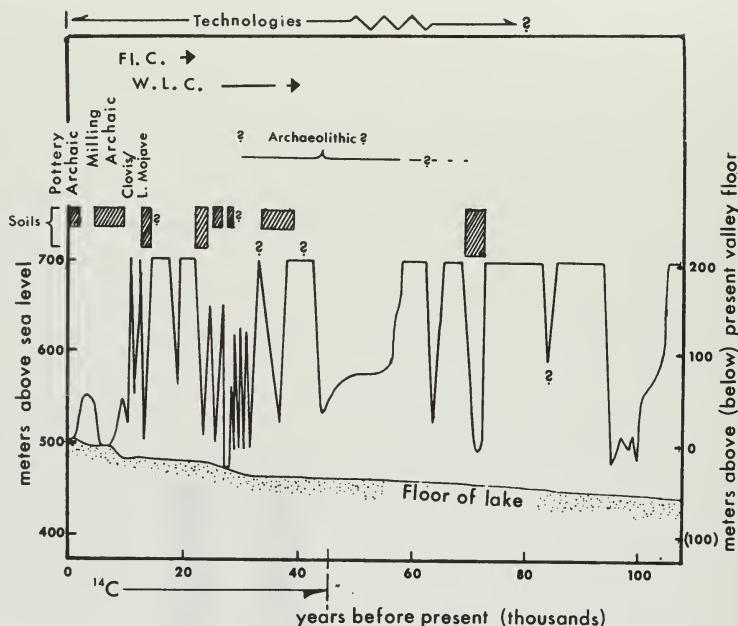


FIGURE II: 1. Parallel changes in water budgets and archeological traditions. Complementary occurrences of lake deposits and soils.

ARCHEOLOGY AND CLIMATIC CHANGES IN THE  
CALIFORNIA DESERTS: SEARLES BASE

E. L. Davis

All areas of California show a close correlation between site distributions, social activities and the climatic cycles that were a determinant of human lifestyles (see Figure II:1). Paleoclimates were products of such complex variables as:

Temperature (mean annual and seasonal)  
Moisture (mean annual and seasonal)  
Rainfall distribution  
Presence of glaciers  
Positions of pressure highs and lows  
Directors of storm tracks in relation to  
mountain masses (VanDevender, 1979:701-710;  
Davis, 1979a:135-150)

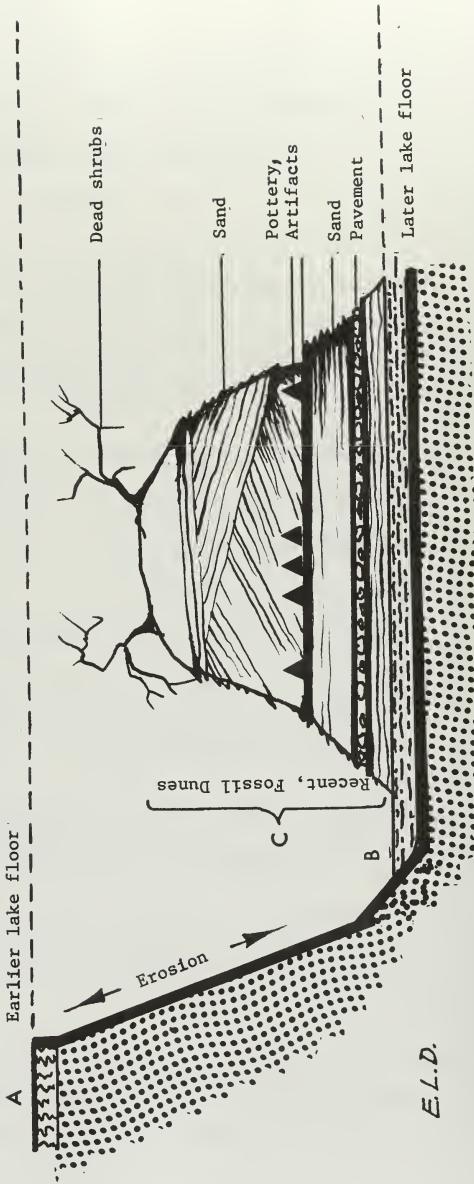
Net results of the climate parameter changes were archeologically visible changes in the lifestyles of people.

Paleoclimatic changes = human residence changes  
Paleoclimatic changes = changes in toolkit size  
and composition

Some archeologically visible changes were purely cultural -- due to trade, intermarriage, population movement, changes in population density, and cultural drift.

FIGURE II: 2 APPARENT RELATIONS OF LAKES AND DUNES: PALEN LAKE N.W.

The north end of Palen Lake has large areas of residual sediments that stand as "witness columns" and eroding plateaus. The sediments are from one to two meters higher than the present lakebed, indicating the former presence of a deep and extensive lake, large enough to deposit the sediments. Since this older lake dried out, its bed has been eroded by wind, leaving the residual forms standing above the clay playa of a more recent lake. Dunes in this recent lakebed have formed over proto-historic sites with pottery.



An environmental parameter that contributes to archeological site distribution and site content is landform -- the shapes of a landscape in which people move and live. Geoarcheological observations were made by the author of dry lakes in the Death Valley System (China and Panamint Lakes) and the Bristol-Cadiz and Palen systems further south. In each system, PaleoIndian sites were found. There was repetitive evidence that catchment basins become economically useful to human foragers mainly when climatic cycles produce a shoreline ecotone: a bog with phreatophytes surmounted by shrub grassland with xerophytes and soil-forming conditions. In most cases, traces of the paleosols are intimately associated with archeological remains. These geoarcheological episodes can be dated only by a geochronology of each basin. A geochronology provides a geological-climatic framework that fits archeological events into a natural scale of time (Figure II: 2 on previous page).

Landforms and climate combined to allow the formation of surface weathering -- a pedological feature called a "soil" and not to be confused with the agricultural term soil (meaning the earth in which we grow plants). Soils and fossil soils (called paleosols) are valuable horizon markers for the desert archeologist. As an example, there would be no argument about the date of the Yuha Burial (Bischoff, et al., 1979) if regional/local sequences of paleosols had been worked out, because a calcic paleosol had formed around the burial and provided a date.

Desert paleosols sometimes contain pedogenic nodules by which they can be identified by archeologists. A description of them follows.

The correlation between archeological deposits and soils (paleosols) is illustrated in Figure II:3, a

STAKE 24 UPPER

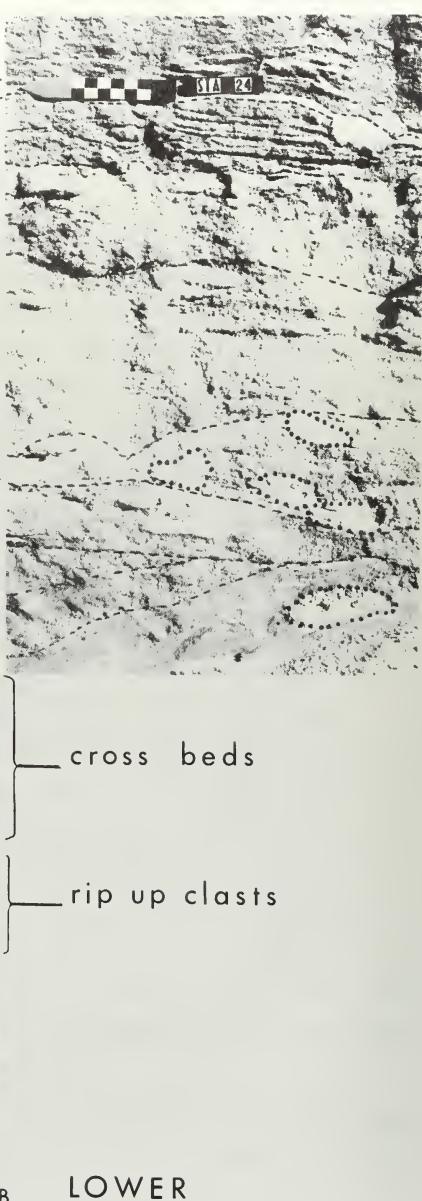
A

weak soil

strong soil

strong soil  
w. rip up clasts

disconformity



B

LOWER

FIGURE III: 3. Late Pleistocene climatic events written in Lake China sediments. Above, culture-bearing paleosols formed during wet/dry intervals. Just previously, cut-and-fill channel deposits marked several periods of deglaciation.

stratigraphic profile of Stake 24, Intensive Test Area, China Lake. The lower section of the profile is a classic example of cut-and-fill stream deposits (e.g., cross-bedded sands, rip-up clasts, lenses, etc.) probably representing deglaciation runoff periods from 17,000-16,000 B. P. and 14,000-12,000 B. P. These contained some archeological and paleontological fragments (mineralized teeth, greatly eroded tools) that were washed in from upstream.

However, a different and archeologically more reliable situation is represented in the upper profile section (right). After 12,000 years B. P. (?) two strong soils and a weak upper soil formed during moist/dry intervals. Our plane table maps suggest that these intervals represented climatic conditions during which pedogenic nodules (discussed in the following section) were formed while hunting-gathering people with a Lake Mojave/Clovis technology were occasionally camping around a system of ponds, marshes and sluggish streams.



CLIMATIC STUDIES AND THE CALIFORNIA  
DESERT CONSERVATION AREA (CDCA)

E. L. Davis

The CDCA is filled with climatic information of economic value. This climatic component is partly reflected in the archeological record which shows whether ancient peoples were living in lake valleys or uplands. Climate is also easily, directly read through geochronological studies of sediments in lake beds, marshes and seeps.

We desperately need to know more about the climate of our earth. Climate controls the habitability and food production of the planetary surface, thereby ranking high as a problem area for long range studies. What changes in living conditions have occurred during the past 20,000 years? The climate changes cyclically. 11,000 years ago the Mojave Desert was a pasture for elephants; today it supports burros and rats. What predictions can be made about deterioration or improvement in climate based upon better knowledge of weather cycles? In an age when our species is exploding -- while crop-killing aridlands advance -- we must focus on reading natural inscriptions of climatic change in order to understand the expectable conditions with which Humanity must work. The California Desert is an ideal place for such studies.

The records are inscribed in the delicately stratified wet/dry records of Pleistocene lakes and fossil marshes in the California Desert Conservation Area shown in Figure I:1.

The structure of this work must be based upon a

geological/climatic framework (Figure I:2) to contain the geoarcheology of each selected locus. The following report (and two CDCA site-location maps accompanying it on file with BLM in Riverside) emphasizes the importance of six loci where the best documentation exists:

- 1) The Yuha-Pinto Wash environs (including Anza/Borrego)
- 2) Pinto Basin
- 3) Pleistocene Lake Mojave
- 4) The Calico Site
- 5) Little Lake to Ownens Lake strip
- 6) China Lake and Panamint Valley

This report contains a short description of each archeological locality (see also the map, Figure I:1); discussions of its place in California Desert prehistoric sequences; specific kinds of work required to elucidate the local geoarcheology; an outline of major dating problems (dating is a sore point in California Desert prehistory) and recommendations for the most effective scientific mobilization needed for a broad spectrum approach to resolution of the local problems.

## SOILS AND ARCHEOLOGY

E. L. Davis and J. B. Nichols

Soils and fossil soils are key pieces of information for an archeologist because a soil is a weathering phenomenon. It marks an interval when a piece of ground was not attacked by either deposition or erosion. Therefore, a soil surface represents a period of stability during which a level piece of exposed earth was available for human use. For all these reasons, archeological clues and remains are frequently lying in or on the A horizon (upper unit) of an ancient soil, called a paleosol. Paleosols exist in three conditions: a) relict (still exposed); b) buried, and c) exhumed. Paleosols and the ability to detect their presence are therefore important to any archeologist engaged in desert field work. Processes of alternate wetting and drying that build the desert soils frequently create small concretions that lie in erosional (exhumed) or relic surfaces. The concretions are clues to conditions of pedogenesis and, when recognized by an archeologist, are a source of invaluable information about the presence nearby of still-buried remnants of the same soil that may contain archeology. The following pages describe the chain of recognition and the implications for predictive use in desert archeology.

It has been our hypothesis that archeological/paleontological sites, representing long sequences of Pleistocene-Holocene cultures, are buried in the stratified sediments of Great Basin dry lakebeds. Eight years of fieldwork on China Lake, California has demonstrated the non-random, patterned distribution of artifacts and animal bone on the lakebed surface (Davis, 1975). Until now, however, our contention

that these surface sites are, in fact, erosionally exposed geomorphological units of a Pleistocene landscape has remained unsupported, due to our inability to relate the site directly to its eroded (and therefore, presumably lost) stratigraphic context. The discovery that a concretion found associated with artifacts and bone is actually a case-hardened marker formation associated with calcic B horizons of paleosols, has not only related the artifacts to their original soil context, but, as an initial experimental test has demonstrated, predicts still-buried sites nearby, which can then be excavated by lateral stripping.

Observation, Description, and  
Identification of Pedogenic Nodules

China Lake is the most recent in a sequence of ephemeral, Pleistocene-Holocene lakes, known collectively as Lake China. These bodies of water formed in a shallow structural depression or graben at the eastern foot of the Sierra Nevada, about 200 km northeast of Los Angeles. The present environment of this valley is a true desert with an average rainfall of less than five inches (Jaeger, 1974). During the current climatic regime, aridity is an expression of cooling/drying trends that have prevailed over the past 3,000 years, creating a xeric landscape of low-relief sands, sinuous gravel windrows, and eroded hollows.

During an initial reconnaissance of the lakebed, a curious, unidentified material was noted, along with scatters of PaleoAmerican artifacts and mineralized bones of a Rancho La Brean fauna. This material consisted of shims, tubes, and gnarled chunks of cemented sand, case-hardened by exposure (Lattman, 1977) so that they rang when struck. For this reason we first called these concretions "clinkers" (Figure II:4). They were found at several elevations and seemed



FIGURE II: 4. Calcrete castings are markers for eroding paleosols that formed during wet/dry intervals.

to form concentrations. Further, they occurred with artifacts and bones.

The team geologist, G. I. Smith, suggested the concretions might be related to an unidentified buried paleosol, and therefore be an index fossil of that soil, and he advised us, "You should educate yourselves in what it means."

Laboratory tests showed that the concretions (dense as stoneware) were insoluble in water but broke down readily in dilute muriatic acid. They were pale in color: 2.5Y, 6/0 (gray) through 2.5Y, 5/4 (light olive brown) with some as deep as 5Y, 6/2 (olive). This color range made the material difficult to see in a trench wall. It was, however, highly visible on the surface (Figure II:5).

In addition to these tests, and because of the observed co-occurrence with most artifacts and much of the bone, we began to map the distribution of the concretions as part of our program of plane table mapping (Figure II:6).

The mapping program had already been designed and partially completed (Davis, 1975.) with the objective of getting maximum topographic/ecological/archeological information. We had established an Intensive Survey Universe comprising about 3 km<sup>2</sup> in the most productive area found during reconnaissance. This productivity appeared to result from the former existence of a series of late Pleistocene marshes which would have attracted people and animals alike. Archeological sites, adjacent to these marshes, had been exposed by erosion. Flooding and scouring had removed much of two lacustrine sands that masked the older, artifact-bearing stratum.

Additional mapping was now needed to establish the



FIGURE II: 5. A nodular layer emerges and breaks up as erosion exposes it.

distributions of pedogenic nodules as either random or patterned. If patterned, were the configurations geological, cultural, or both? The Stake 1/Stake 24 locality was selected for 50% of the new mapping and 100% of the excavations because the locus showed quantities of flakes, artifacts, and bones recorded on the original plane table plot (Figure II:6). In addition, the locus was topographically diverse, grading in degree of erosion from the undisturbed, lacustrine sands mantling Stake 1 knoll down through various stages of excision ending in the low basins crossing Stake 1, Quadrants A and B (shown at the foot of the plane table map, Figure II:7). Of particular interest was the fact that barren sand on the knoll was surrounded by flakes lying on coarser ground. The sands were always sterile.

The plane table and original field map were set up again over Stake 1 datum and plots of pedogenic deposits were added to previous scatters of stone and bone. The concretions were seen to be clearly patterned in distribution, being arranged both in clusters and in arcuate lines of two kinds: exterior arcs around the eroding sides of Stake 1 knoll, and interior arcs around the perimeters of erosional basins both north and south of the instrument stations. The lines resembled contour lines on topographic charts and seemed to be related to eroding margins of culture-bearing layers, of which there were evidently more than one.

Histograms of quantities and elevations of the concretions formed weak trimodel curves (Figure II:8) suggesting that there might be three different sources, at three separate stratigraphic levels, in this section.

We now hypothesized that the associated deposits of concretions (representing a paleosol), artifacts, and bones, continued back beneath mantling layers of sand at Stake 1.

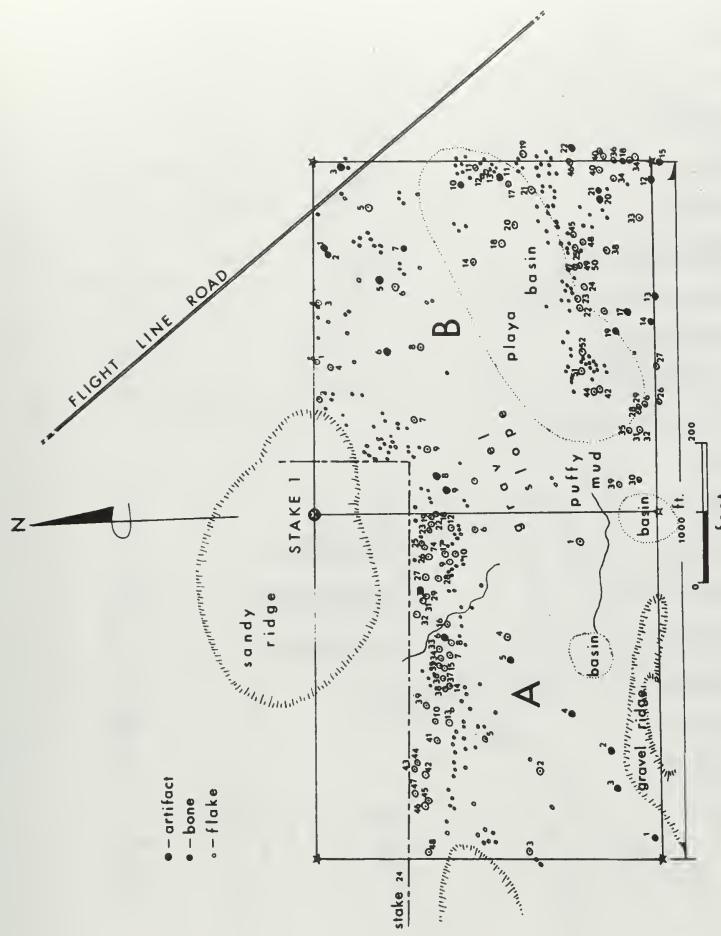
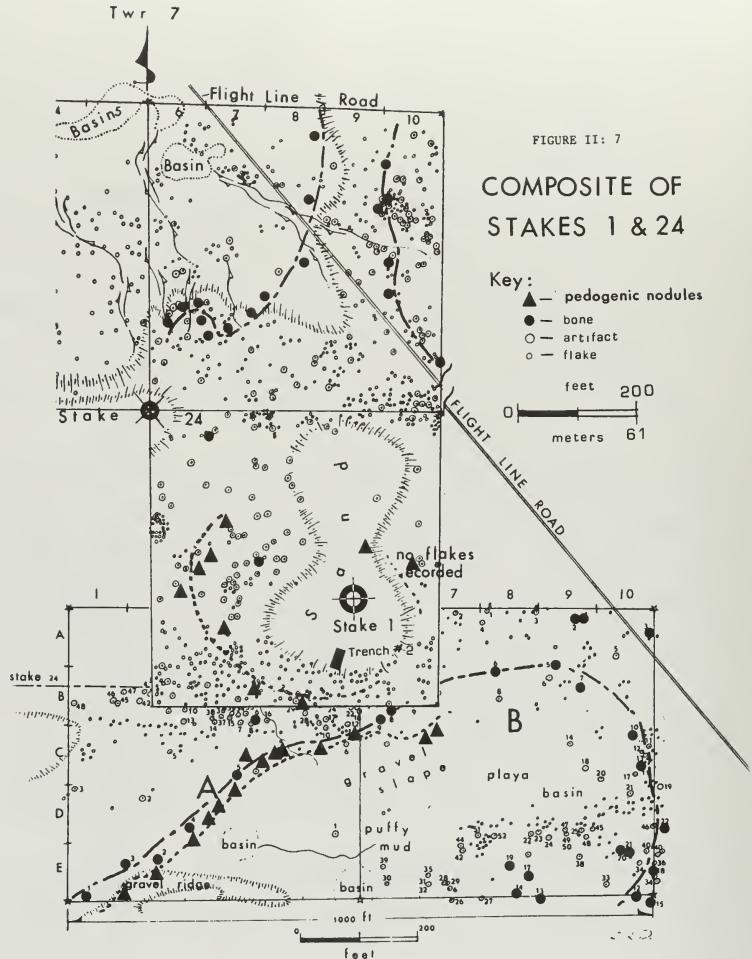


FIGURE II: 6. Bones in linear arrangements suggest association with a shoreline.

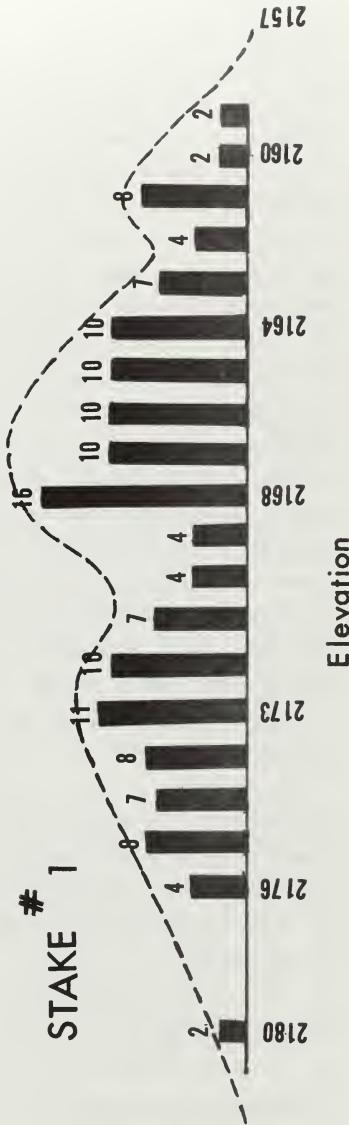


# OCCURRENCES OF PEDOGENIC NODULES

STAKE # 24



STAKE # 1



Number

This hypothesis was well supported by the fact that both pedogenic and cultural clues cut off sharply at the edge of the sandy cover. We predicted that if the sterile layers were stripped off to the depth of the ancient soil, we could find both concretions and artifacts within it. Therefore, a line was drawn on the map connecting Stake 1 datum with the thickest concentration of flakes (a bearing of 196°) and a 3 x 5 m pit -- Stake 1, Trench 2 -- was stripped horizontally into the margin of the sand to a depth of about 1 m. The stratigraphy was well defined. At the top were layers of sand, slightly different in color (when moist) and in particle size; they were separated by a thin bed of the concretion that evidently represented a weak, incipient soil. This soil possibly coincided with a dry interval about 2,500 - 3,000 years ago. The upper sand was fine, yellowish, soft, with some coarser lenses and was predominantly lacustrine in origin (Smith, written communication 1973). The lower sand was coarse, more consolidated than the above, lacustrine, grayish (10YR, 7/2), with a sharp contact at base and the weak soil previously mentioned at top. Beneath the lower sand was a strong, calcic paleosol. This consisted of a very coarse sand of lacustrine origin, yellowish brown (10YR, 5/4) at top, with a white caliche layer at base, including pods of the "clinkers," still in a soft and clay-like condition. The pods, which seem not to case-harden until exposed to air and sunbaking on the surface, could now be identified as pedogenic nodules of calcareous clay, related to the formation and growth of both exposed and buried soils (see below).

#### Buried Flakes

At various levels within the paleosol, five small trimming flakes of agate, obsidian, and chalcedony were found. They were cemented into the dense caliche and gravel, and

evidently did not represent a "living surface." It is more likely that the flakes had been incorporated, over a considerable period of time, in surficial gravels that were slowly undergoing conversion to a calcic horizon or paleosol (Valentine, 1976). All five trimming flakes had lain exposed long enough to become sandblasted before they were buried.

#### Summary and Interpretations

Our present understanding of pedogenic nodules has been summarized by geologist, G. I. Smith, as follows:

Pedogenic nodules occur as fragments, tubes and pods found loose on the surface of Quaternary lake deposits in China Lake. The nodules are products of near-surface geologic processes acting on the calcareous horizons of fossil soils. Mapped "lines" of concretions on the present land surface represent the upper limit of loose fragments on lower slopes. Concretions were deposited during dissection of the lake beds and coincide with the projected position of fossil soil horizons exposed in trenches and pits. Several horizons have been exposed in excavations, providing sources for nodules at different levels. The uppermost horizon is the one that coincides approximately with the "line" representing an upper limit of artifacts that have weathered out of the lake deposits, so the clear inference is that they were resting on or slightly above that horizon.

The calcareous pods so commonly found in desert soils are attributed by most soil scientists to the action of rain water. The rain contains carbon dioxide and thus acts as a weak carbonic acid, reacting with calcium-bearing minerals in the zone of wetting. Dissolved calcium (accompanied by the carbonic acid) migrates downward until the limit of wetting is reached. Here they interact and precipitate calcium carbonate. The characteristic form is as pods and platy layers with more intensively developed soils having more strongly developed calcium carbonate concentrations.

It is not clear why the pods, when nearly exposed by erosion, recrystallize to a more coarse-grained limestone. Apparently, renewed wetting near the surface causes some crystals to grow larger while others are dissolved. Sand grains normally included

in the pedogenic calcium carbonate pods are included in the recrystallized carbonate nodules, and on weathering after exposure, they tend to project out from the calcium carbonate cement to form what appears to be a "sandstone" with a hard carbonate bond (written communication, 1977).

Our own reconstruction of geologic/climatic and anthropological events, accounts for Stake 1 archeological geometry as follows. There was a late Wisconsin dry interval of considerable duration after 10,800 B.P. Coarse, lacustrine gravels, deposited about 13,000 and 12,000 years ago, began weathering into a soil with developing formations of pedogenic nodules. This dry surface was visited on several occasions by PaleoAmerican foragers. Subsequently, Altithermal I (a prolonged drought) caused the area to be abandoned for a long time. The Altithermal surface weathered and developed a strong soil, containing both cultural traces and pedogenic concretions. Information from Searles Lake (Smith, 1968; Smith, 1977) and Little Lake (Mehringer and Sheppard, 1978) shows that moister climatic episodes commenced again about 6,000 years ago. Renewed transgressions of Lake China deposited a lower and coarser sand, previously described as part of the upper unit at Stake 1. Another dry interval (Altithermal II) occurred about 2,500 years ago, allowing a weak, calcic horizon to form. This dry interval produced the highest elevation deposits of sandstone shown on the map (Figure II:7). No artifacts of this period happened to be found in the test at Stake 1, Trench 2, but tool and sandstone distributions on the map lead one to suspect that a few artifacts occur in this context. Animal bones also were absent in Trench 2, probably for the following reasons. In all site areas, deposits of artifacts and bones tend toward complementary distributions, although they are seldom mutually exclusive. Bone frequencies are low at camp sites which, like Stake 1 knoll, occupy slightly higher

elevations. In contrast, stone tool frequencies are high in the camps but low around the margins of former, swampy basins used as animal traps. Butchering localities have both stone and bone. Figure II:7 can be interpreted as an area with archeological overprints of campsites clustered about a hill-  
ock now occupied by the instrument station. Soil margins here are expressed by pedogenic nodules deposited in convex arcs around a positive landform. The archeological geometry of kill sites and animal processing sites is diametrically opposite from that of soils. Animal-associated traces are legible as concave arcs of bone and pedogenic nodules around negative landforms.

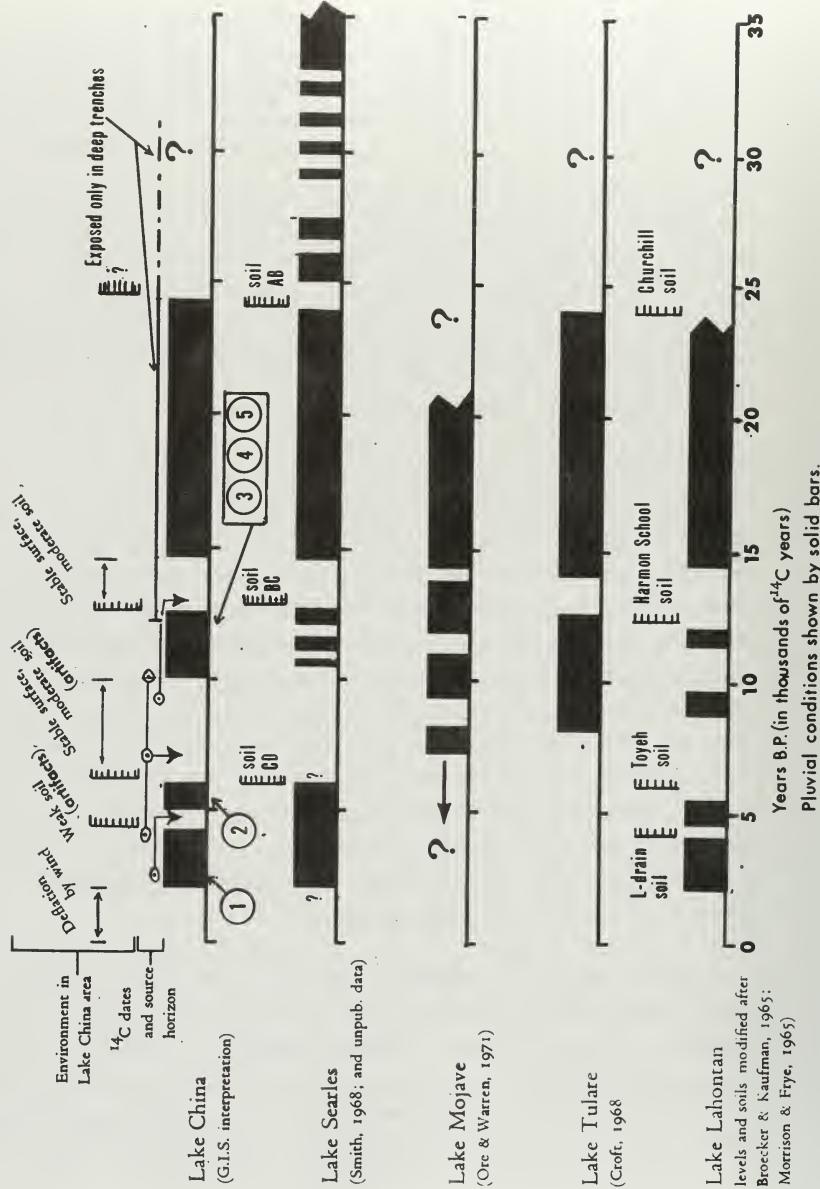
#### Conclusions

Pedogenic nodules are valuable horizon markers for archeology in eroding deserts. They indicate the presence of ancient, stable surfaces where people were able to camp. With time, calcic soils developed beneath these surfaces, with increasing amounts of clay and calcium carbonate (visible as white caliche) being incorporated in their B horizons. Calcium carbonate paleosols can be dated by the  $^{14}\text{C}$  method -- but with two cautions. First, they are layered (Valentine, 1976) and so laboratory samples must be removed as very thin slices. Second, there is always risk of contamination by carbonates of unknown age and origin. It is better to consider calcic layers as natural, chronological dimensions of "Mean Residence Time" (Valentine, 1976).

Use of soils as climatic indices is a common practice of earth scientists (Valentine, 1976; Smith, 1968; Smith, 1977; Campbell, 1967; Morrison, 1965; Dalrymple, 1958), but archeologists still do not use their information to best advantage. Karl Butzer (1975) criticized this reluctance in an article entitled "The Ecological Approach to Archaeology: Are We Really Trying?" Butzer suggested requirements of more natural

Figure II:9. After G.I. Smith in: E.L. Davis ed., 1978, Figure 93.

## Comparison of pluvial conditions of five Western lakes



sciences in the training of an archeologist. Smith's advice to us -- "Educate yourselves in what it means" -- should be equally profitable for other prehistorians. In the desert west, we must begin intensive studies of soil sequences, since these sequences of paleosols are natural time brackets for human events. The major pedogenic episodes appear to be ubiquitous throughout the Great Basin (Figure II:9; Morrison, 1965; Broecker and Kaufman, 1965; Croft, 1968; Ore and Warren, 1971).

Finally, we suggest that weathering layers containing pedogenic nodules, artifacts and/or animal bone, can point like a directional arrow to buried archeological sites. Desert archeologists can profitably adopt the following three assumptions:

- 1) The objects exposed by erosion were once members of stratigraphic sections.
- 2) Portions of these sections are still safely buried nearby.
- 3) Deposits of pedogenic nodules indicate that the stratum of burial lies just above the pedogenic stratum.

By horizontal (stripping) instead of vertical excavation, the cultural/pedogenic matrix can be exposed for analysis.





## ARCHEOLOGICAL TIME

E. L. Davis

There are a number of different ways to relate time with human activities in the desert past: by placement within a known geological/climatic framework (Figure III:2); by association with a chemical process (e.g., development of an hydration rind on obsidian) that requires a known span of time under known conditions of average temperature; by association with the decay of radio-isotopes ( $^{14}\text{C}$ ,  $^{40}\text{K}$ ,  $^{40}\text{Ar}$ , Uranium-Thorium disequilibrium, etc.); association with archeological materials -- tools (Figure III:1), architectural details, potteries and traditions of rupestrial arts of known time periods, etc. Archeological time can also be estimated by linking archeological activity with a natural condition of known and limited duration. In this case, discussed below (and again in Section IX) it is subsumed that a "not later than" age bracket can be assigned to late Pleistocene woodworking tools from presently treeless places by extrapolating to them the known, terminal date of Pleistocene forest retreats. This toolkit is defined on page 43. People only made tools for shaping wood at a time and place when trees were present. (The Eskimo practice of using beach-line driftwood is considered negligible in the Pinto Wash, Yuha and Panamint basalt quarry localities discussed in this report.)

### Time Relations with Changes in Toolkits, Forests and Habitations

Six classes of tools suitable for working wood occur on the floors of California deserts that are far from trees

# PROPOSED KNIFE-POINT SERIES, CHINA LAKE, CALIF.

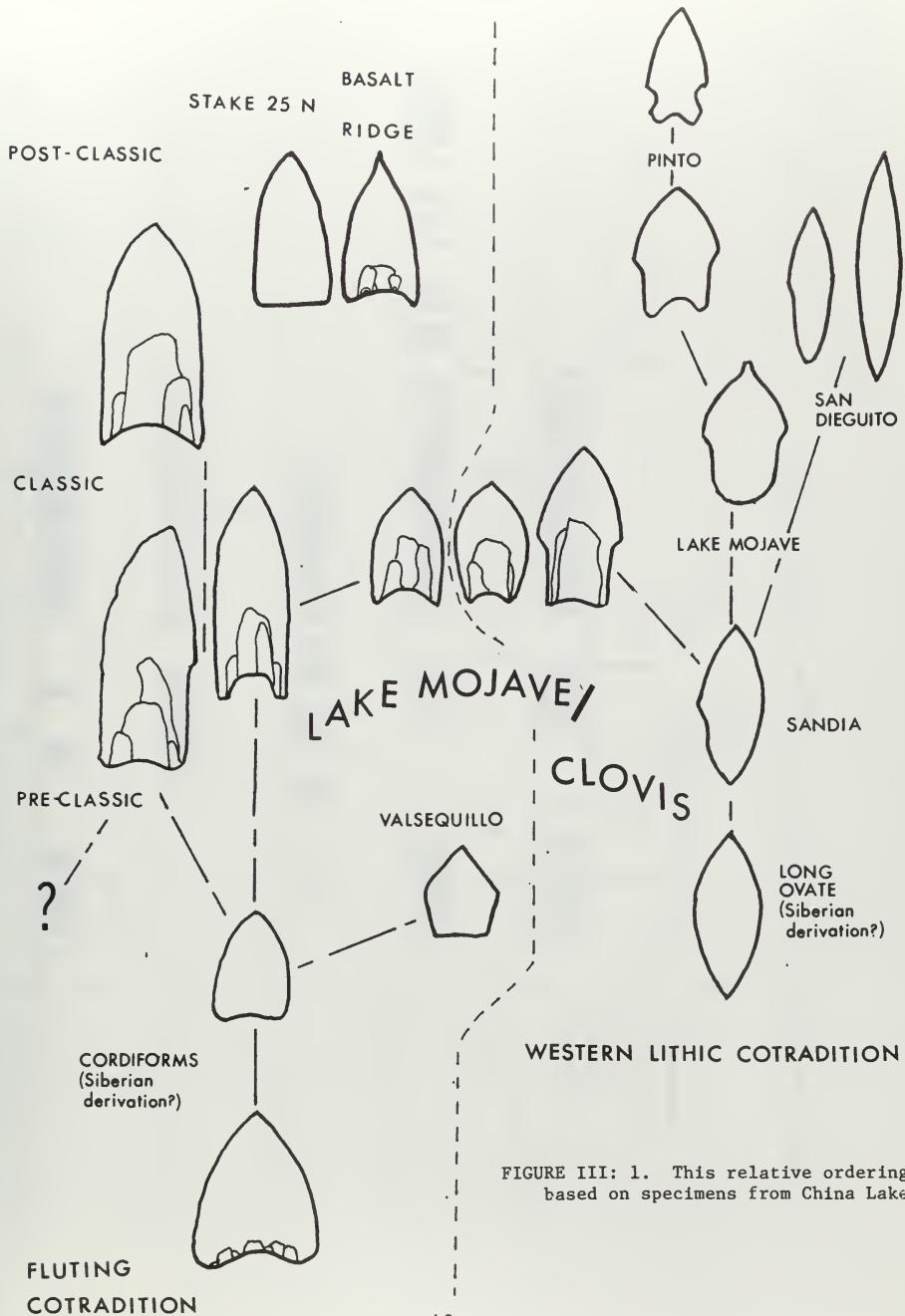
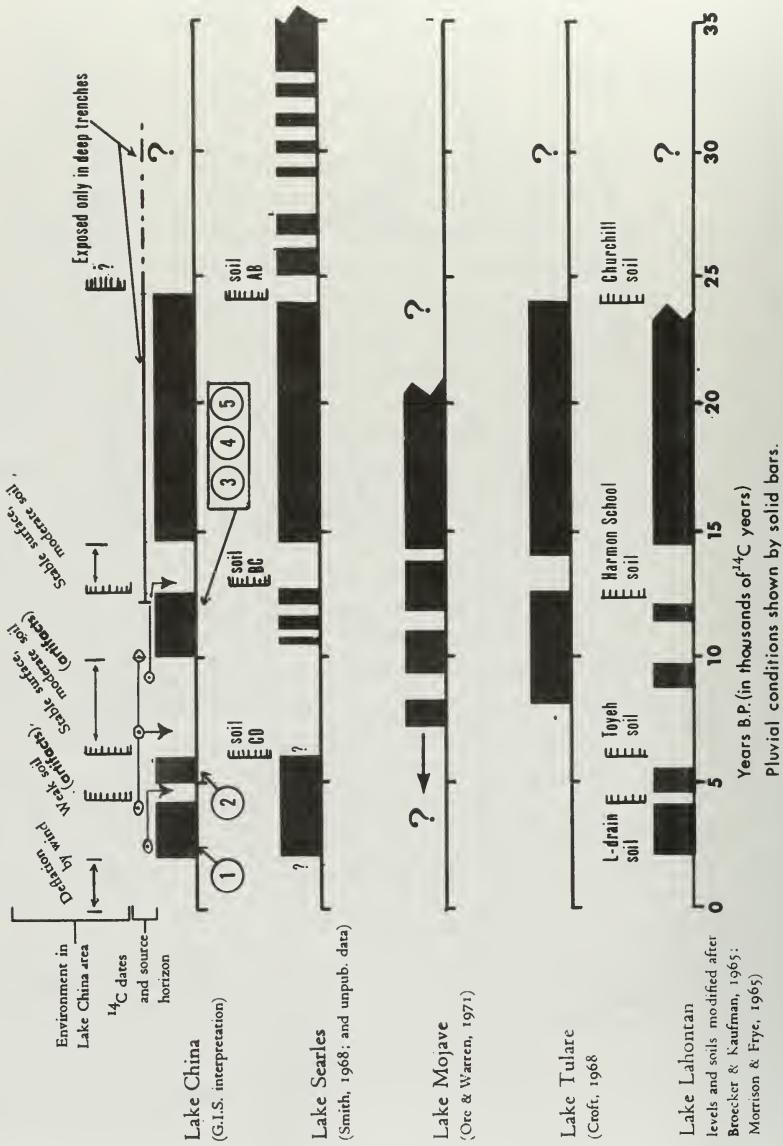


FIGURE III: 1. This relative ordering is based on specimens from China Lake.

## Comparison of pluvial conditions of five Western lakes

FIGURE III: 2. Note the correspondences of episodes of high or low water and soil formation. Diagram prepared by G. I. Smith in Davis 1978, Fig. 93.



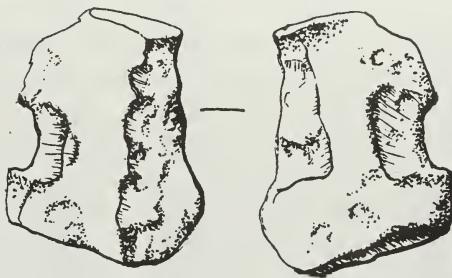
during present climatic regimes. The classes of implements are: spokeshaves for shaft smoothing (Figure III:3); skreblos or backed chopping tools for rough splitting or shaping; heavy choppers for roughing out shapes; large adzes with tangs for hollowing; triangular beaks for boring; and tapered wedges for splitting thin slabs. These are illustrated in the section on quarry-workshops of Panamint Valley. I propose that all these tools are relics of assemblages deposited before 11,000 B.P. Mountains at this time were forested to low elevations over the entire Southwest and it is likely that woodland parks extended across the desert floors, providing raw material for woodworking industries. After 11,000, forests retreated rapidly to high elevation leaving desert interfluves treeless and displacing woodworking from open Holocene deserts. Therefore it is likely that all such tools found in open desert floors are greater than 11,000 years in age. The spokeshave shown in Figure III:3 is an example.

This section outlines a sequence of well-known bifacial objects (knives and weapons). Most are widely recognized as indicator fossils or "time markers." This sequencing and its climatic implications is illustrated in the southern, central and northern deserts.

The sequence appears to start with two parallel traditions described in the section on Macrolith Industries. These traditions are a) polyhedral core-and-blade, and b) slab and chunk tools. Core-and-blade is more visible on the coast and in the Yuha Desert where cobbles abound, while slab and chunk tools are more frequent in the Panamint and China Lake areas where laminar stone is common.

After 20,000 years ago, specialized bifacial tools like the 21,050 year-old points at Valsequillo (Irwin-Williams, 1971) became ubiquitous. Many have been excavated in

South bank Pinto Wash, Imp. Co. CA,  
locality with large sandstone outcrop, at  
about 100 ft. contour.



Bipolar blade frag. modified both edges  
as a spokeshave. Weathering: extreme, both  
surfaces deeply pitted all over.

L: 4.8      W: 3.7      T: 1.3

Chalcedony      5Y 2/2      dark olive

## Yuha Desert

THIS SPOKESHAVE MADE ON A BLADE WAS FOUND  
NEAR THE 85 FOOT CONTOUR LINE ON THE SOUTH  
BANK OF PINTO WASH. IT MUST HAVE BEEN IN  
USE BEFORE THE RETREATS OF MOUNTAIN (AND  
GALLERY?) FORESTS 11,000 YEARS AGO.

FIGURE III: 3

radiometrically dated situations and can be used (with caution) as index fossils for time. A relative technological ordering for the Mojave Desert between 25,000 and 4,000 years ago is presented in Figure III:1.

The sequence of drawings presented as Figure III:1 is approximately in chronological order. It is used to illustrate and amplify the concept of a "proposed knife/point sequence." This fits into the "Bifacial Traditions" on the right-hand side of Figure I:3.

The basic premise of this sequencing is that the Western Lithic Co-Tradition (Davis, Brott and Weide, 1969) (of which Lake Mojave is a part, see Bryan, n.d., Smith Creek Canyon) is older in the Northern Mojave Desert than is Clovis (in press, 1978c). In this area, Clovis (a fluting co-tradition) appears to have evolved out of the Western Lithic Co-Tradition in some manner which is not yet understood, or to have intruded from the south and east.

Intermediate forms supporting this view are illustrated in drawings on the edge punched cards used as illustrations for the Panamint Valley Section (Section IX).

It is important to note that the knife/point seriation mentioned above is assumed to be relatively recent in California archeological time as proposed in this report. The conceptual model used throughout the report is illustrated in a CDCA Master Chronology graph, presented in Section B and used in Sections VII, VIII, and IX (discussions of well-known, already-published sites and areas in the southern, central and northern Mojave Desert).

### Radiometric and Other Means of Measuring Time

Archeological time in the deserts is difficult to measure radiometrically. Organic matter does not usually survive the elements and carbonate contamination is always a problem. Obsidian hydration rinds cannot be measured because long exposure allows obsidian surfaces to be continually sanded away so that measurements are not true.

Desert time is best measured in sequences of natural events: high water and low water of the lakes; soil formation on fans and lakebeds (Figure II:2). We observed that, at Bristol Lake, Cadiz Lake (Davis, 1979a:117-150), and China Lake (Davis, ed., 1978c:27 and Figure 28) there is a 1:1 correlation of stone tool deposits and deposits of paleosol remnants detectable as chunks, shims, and casts of clayey caliche from eroded B horizons. To the archeologist, soils are time markers. Soils (which are weathering phenomena) form on a land surface that is in repose, subjected neither to deposition nor erosion. In a lakebed, of course, soil formation at a given place requires that water should have abandoned that place for a measurable length of time.

Therefore, the soils and low water deposits of sand and silt are related in the sedimentary deposits of a lake while high water can be read in deposits of clays (deep lake) or gravels (shallow lake). Each Pleistocene/Holocene lake within the CDCA wrote its own autobiography -- pages out of the earth for an archeological investigator to read. These water level/soil relationships are shown in Smith (1978:168) and Figure 93. See also Figure II:4 this section. Another kind of time scale measured in water/earth relationships can be deduced from contents of lake bottom cores; e.g., pollen, snails and plant macro-fossils (see Mehringer and Sheppard, 1978:163, Fig. 91) like those from Little Lake.

It is important to understand that "pluvial" lakes fluctuated almost continuously, particularly after 17,000 years ago, therefore lake levels can be used as time clocks for archeological deposits within a lake perimeter (Figure III:4) Sites at different elevations around a lake are necessarily different in age (mutually exclusive for time). Because lakes fluctuated constantly, the older sites are just as likely to be at low elevations as on a high terrace. High lake terraces are not comparable to high terraces of a down-cutting stream.

Tephra (volcanic ash) is another time marker for desert sites -- an absolute rather than a relative clock, that is radioactively "set" as the melt from an eruption begins to cool. Unfortunately, ash layers are only available downwind from an eruptive center or in its immediate neighborhood. Three recent ash-falls from the Mono-Inyo craters deposited about 720, 1,190 and 3,375 years ago (Wood, 1975; Lajoie, 1968) are examples. However, they are detectable in Long Valley near Mono Lake but are not present in China Lake or Panamint Valleys. The Bishop Tuff (700,000 years) and the 6800 B.P. Mazama Ash (from the explosion that formed Crater Lake) are two other famous marker layers.

### Correlations of Lake Levels, Dates and Sites

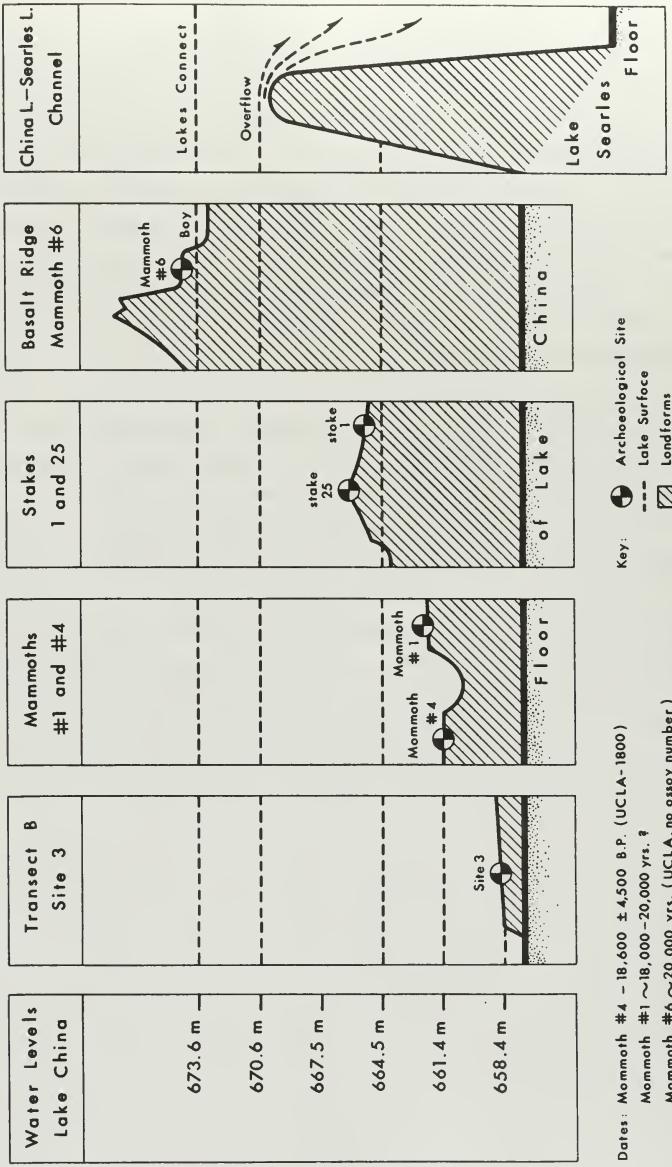


FIGURE III: 4. This drawing, based on site information at China Lake, shows that sites at different elevations were mutually exclusive for time. When the high ones were beside a good subsistence marsh, the low ones were submerged.

A DIM, ICE-AGE TRAIL

E. L. Davis

In order to track PaleoAmericans in the New World it is necessary to search both strenuously and persistently. Paleolithic clues are scarce and indistinct. In addition, a strongly negative position is assumed by many U. S. archeologists . . . "even if it was good I wouldn't like it." Investigating the New World Paleolithic has a taint of vagrancy, like picking up coal by the railroad tracks. In contrast, Archaic research is a different world. There is a host of well-documented Holocene sequences that date between 8,000 years B.P. and the middle of the nineteenth century. For sites older than 8,500 B.P. the record attenuates rapidly and documenting anything before 12,000 B.P. is like squeezing blood out of a turnip. For a decade, the Maginot line of conservative prehistorians has been the Clovis Conquest, 11,500 years ago.

Nevertheless, the paleontology/archeology of China lakebed indicates that a peak of action in Great Basin pre-history had been reached before 11,500 B.P. During a lake rise between 14,000 and 10,800 years B.P., migratory foragers of the region had become seasonal hunters who used lakeside marshes as bog traps (Davis, 1963, 1975, 1977c). A classic phase of Lake Mojave/Clovis technocultures took place during terminal Pleistocene lacustrals. After 10,800 B.P., Altithermal I began, marshes and savannas died, and the megafauna population shrank. HOLOCENE DESERT CULTURES DEVELOPED IN RESPONSE TO CLIMATIC DETERIORATION. The endless California Archaic continued to develop local expressions until the introduction of agriculture or arrival of European shock waves in the nineteenth century.

Archeological records from two famous closed sites, Danger Cave (Jennings and others, 1957) and Lovelock Cave (Loud and Harrington, 1929) provide glimpses into facets of lives of early Holocene and mid-Holocene foragers in the Great Basin.

Archaic records from other parts of the United States are increasingly detailed, expanded by constant improvements in archeological technologies, procedures, and theories. The Koster open site in Illinois (Struever, 1977:93-101) is one example. Koster has four habitation levels with a depth of thirty feet. The basal date at present is 8800 years B.P. for Horizon 12. Tactics are interdisciplinary. Another long record of the American Archaic has been worked out in Gatecliff Rockshelter, a closed or cave site in Nevada within a pine nut ecotone of seasonal, open camps (Thomas, 1976). Extensive work has also been done on Windust Phase Archaic caves (closed sites) along the Snake River (Rice, 1972). Windust overlaps terminal PaleoIndian with a date of 10,750 B.P. Fort Rock Basin, Oregon has another sequence of excavated caves (Bedwell, 1973). Records span early Archaic and late PaleoIndian periods if one judges by technologies and morphologies of the stone tools. Radiocarbon dates are inconclusive since most of them lack clear association with cultural materials. An unusually long Archaic continuity has been dissected by careful work in another closed (cave) site in Washington County, Pennsylvania: The Meadowcroft Rockshelter (Adovasio, 1975a&b, 1977). Meadowcroft has one of the longest archeological sequences in the Western Hemisphere although, like other closed sites, it lacks the diagnostic tools that characterize work areas of open camps. Closed sites seem to have been used for caches or special occasions and do not contain toolkits of broad occupational spectra.

However, Meadowcroft has one of the few, tenuous bridges

between the New World Archaic and an Upper Paleolithic that is scarcely recognized in the hemisphere. Lower stratigraphic units of the rockshelter reach back possibly to 16,000 and 19,000 years ago. Pikimachay closed site in the valley of Ayacucho, Peru (MacNeish and others, 1970) has a sequence of nearly comparable length. Dates from the lowest levels are  $14,700 \pm 1400$   $^{14}\text{C}$  years B.P. and  $20,000 \pm 1000$   $^{14}\text{C}$  years B.P. (MacNeish, 1976:327). Beyond this point we enter a labyrinth where we must grope our way. As evidence becomes older there are fewer handholds or landmarks and dates are scarcer. However, there are some tantalizing clues, as follows.

From the Old Crow River in the northern Yukon Territory, a fleshing tool made of caribou tibia has been dated  $29,100 \pm 3000$   $^{14}\text{C}$  years B.P. (Irving and Harrington, 1973:336). In the Valsequillo region, Puebla, Mexico, stone tools and extinct animals were found in apparent association (Irwin-Williams, 1969:82-83). The archeological materials are estimated to be greater than 21,000 years in age. In Texas, a crude, cordiform biface was found by paleontologists in association with an extinct fauna (Jelinek, 1960:932-939; 1966:434-435). Another group of Texas paleontologists excavated three crudely carved human heads made of sandstone, laying on bedrock. The effigies were beneath 26 feet of gravels containing Pleistocene animals (Krieger, 1964:47). Another Pleistocene faunule in probable association with PaleoAmericans in Nevada was reported by George Gaylord Simpson (1933). In the 1960s, a geological field crew from the Canadian National Museum collected bone fragments of a young child from sands beneath a Wisconsin glacial till (Stalker, 1969:424-428; 1977). The geologist in charge estimated the remains to be at least 37,000 and possibly 60,000 years in age. Disbelief and lack of purposeful

interest have done much to damage fragile records of the New World Paleolithic. As an example, in the past century, a fossil hunter named Albert Koch uncovered the remains of a mastodon with some stone tools. After taking these relics on tour, Koch sold the proboscidean to the British Museum. The artifacts went to Germany (Montague, 1942:380-381).

Lake China sites have a lot of animal bone, some of which is associated with both artifacts and soil remnants. Two mammoth processing localities had a chopper (a butchering tool) among the bones. One of these mammoth bone fragments had been flaked in the same manner as the Old Crow materials (Bonnichsen, 1975) indicating that this work was done while the bone was green. Association is with a soil possibly correlating with the 14,000-16,000 year old soil of Lake Searles valley (Smith, 1968:Fig. 5:301).

The apparent antiquity of some PaleoAmerican evidence and its repeated occurrence in a context with the extinct animals of Wisconsin-age deposits is intriguing. It is also exasperating that this evidence hangs unconnected in time. In addition, the finds are so disparate (frequently accidental) that no pattern emerges so far. We need a single, promising region in which configurations begin to materialize like images in a developer bath; a region in which paleo environmental continuities can be extrapolated and cross-referenced from place to place. The Great Basin Lakes Country is such a region. Its many Pleistocene lake valleys are the places. Eight years of sporadic field work in the basin of Lake China (Davis, 1974a, 1974b, 1975a, 1977a, 1977b, 1978c) give a good idea of the wealth of information such a valley contains. There is a Rancho La Brean bestiary; long (though discontinuous) cultural sequences and geological sections with delicately bedded sediments containing the animal remains and tools. By means of mapping, deduction, and

experiments a 1:1 relation of artifacts with buried paleosols has been established at Stake I Trench 2 (Davis and Nichols, this volume). The procedures and principles can be used throughout the Lakes Country where major climatic episodes were comparable. Work can be long continued and intensive in a region like the Lakes Country. If one really wants something, one must be willing to wait, to persevere to get it. Major discoveries have been made in other parts of the world by individuals who surmised that a certain piece of paleo-historic evidence must exist, who searched a long time and went to extraordinary pains to track it down.

Schoentensack waited twenty years for the Heidelberg jaw, Berckhemer nearly as long for the Steinheim skull. When a human tooth and some other fossils came to light in a Peking drugstore in 1900, Davidson Black had to search the region around Peking most carefully in order to find Choukoutien, the site of Peking Man. And all of our finds from Java are the result of a long and systematic search . . . . The discovery of early man in Java begins with an idée fixe . . . [of] Eugene Dubois . . . (Von Koenigswald, 1947).

The Leakeys' prolonged quest for early hominids and stone tools in east Africa is a final example.

A COMPARATIVE REVIEW OF PLEISTOCENE SITES

IN THE NEW WORLD

E. L. Davis

The antiquity of California archeology is usually measured against California alone (e.g., Del Mar Man at 48,000 years B.P. or the Yuha Burial with an approximate age of 22,000 years B.P.). This parochial approach is too narrow. The prehistory of California deserts can be evaluated for age only when considered as part of the New World in general. Let us see what well-documented sites have been reported elsewhere in the Western Hemisphere and then relate to them the antiquity of California desert sites by the following simple scheme that is based on an assumption of migration from northeast Asia:

- a) The oldest California sites will be younger than the oldest sites of Alaska (populations needed time to flow southward).
- b) The oldest California sites will be roughly contemporaneous with the oldest sites of mid-latitude United States.
- c) The oldest California sites will be older than the oldest sites in South America because time was needed for populations to flow through isthmus and mountain bottlenecks.

Validating the presence of Paleolithic human populations in the CDCA area requires a number of stages of verification. 1) Dated evidence on the Alaskan side of Beringia, demonstrating that a successful crossing from northeast Asia had been made during the Pleistocene. 2) Dated evidence from Southern Canada showing that PaleoAmericans had spread

through the northern part of the continent prior to advances of the Cordilleran and Laurentide ice sheets between 22,000 and 17,000 years ago. 3) Early dates from various parts of the continental United States indicating coast-to-coast spread of pre-Clovis peoples. 4) Dated evidence from South America indicating that both continents were inhabited during the Pleistocene. Information satisfying all these requirements is presented in Table 4, "Pleistocene Dates for Early Human Activities in the New World."

Item 1), above, is met by two  $^{14}\text{C}$  dates from the Old Crow River, Yukon Territory Canada (Irving and Harrington, 1973). One ( $> 41,000$  years B.P.) gives a time bracket for the lowest level of humanly fractured bone that was found in this area. A caribou-bone flesher (a surface find) has a  $^{14}\text{C}$  date  $> 27,000$  years B.P. Item 2) is substantiated by a date of  $> 37,000$  years B.P. for the Taber Site: the remains of a young child found deep in deposits underlying Classical Wisconsinan glacial till in Alberta Canada (Stalker, 1969, 1977.). People were living at lower latitudes of the New World by mid-Wisconsinan times. Item 3) provides a wide choice of Pre-Clovis dates from coast-to-coast in the United States: the Del Mar skull with a racemization date of 48,000 years B.P.; on Santa Rosa Island; The Wooley Site on Santa Rosa Island has charcoal and mammoth bones with an age greater than 40,000 years (the limit of competence of the  $^{14}\text{C}$  method); the Calico Site, which was recently re-examined by Dr. Roy Shlemon of Newport Beach, has artifact-bearing strata in Stage V geological levels (80,000 to 125,000 years old); Meadowcroft Rockshelter, Pennsylvania has a date on the lowest level of 16,178 years.

In Mexico, the Tlapacoya I early site dates 24,000  $\pm 4,000$  years. In South America at Taima-Taima, a juvenile

mastodon with a stone point lodged in the pelvis has been dated 12,980 B.P. (older than Clovis by 1,400 years). At South America's extreme tip the Fells Cave site, near The Straits of Magellan, has a charcoal date of 10,720 years making this almost as old as the Clovis sites thousands of miles farther north. And South America has records of at least one population with Paleoanthropine cranial characteristics, described in this report (Section III).

It seems that all parts of the Western Hemisphere were thinly inhabited. There should, therefore, be many traces of people, Wisconsinan or earlier, exposed or buried, in the California deserts. There is already considerable evidence that the traces are all around us. All that is required to shape these clues into a fascinating detective story of Ancient Californians is three essential ingredients: persistence, interdisciplinary research and funds.

TABLE 4. PLEISTOCENE DATES FOR EARLY HUMAN ACTIVITIES IN THE NEW WORLD\*

AREA	SITE NAME	DATE (yr. B.P.)	REFERENCE	MATERIAL	DATING PROCESS
A. FAR NORTH <u>YUKON</u>	1. Old Crow River	29,100 <sup>±</sup> 3,000 (GX-1568)	Irving and Harrington 1973	caribou flesh	<sup>14</sup> C
	2. Old Crow River	~27,000	Harrington 1975	dates lowest level of bone industry	
B. SOUTH OF <u>ICE SHEET</u> <u>CANADA</u>	3. Taber Child (1969)	>37,000	Stalker 1969	bone	stratigraphic
	4. Taber Child (1977)	>37,000 (GSC-888)	Stalker 1977	wood	<sup>14</sup> C
C. CONTINENTAL <u>U.S.</u>	5. Calico Site (lower >80,000 level)		Shlemon, personal communication 1979	geological estimation	
	6. Del Mar Man	D/L 0.53 48,000	Bada, Carter, Schroeder 1974	skull	aspartic acid racemization
	7. Bassalt Ridge	42,000	Davis, Jefferson and McKinney in prep.	fossil mammoth tooth	uranium series disequilibrium dating
	8. Wooley Site	29,700 <sup>±</sup> 3,000 (L-290R)	Berger in press	fire area with burned mammoth bones	<sup>14</sup> C
	9. Los Angeles Man	>23,600 (UCLA 1430)	Bada, Carter, Schroeder 1974	skull	aspartic acid racemization
	10. Yuha Burial	21,500 <sup>±</sup> 2,000-1,000 (GX-2674)	Childers 1974	caliche scraped from bone	<sup>14</sup> C
	11. Laguna Beach Men	17,150 <sup>±</sup> 1,470 (UCLA 1233A)	Bada, Carter, Schroeder 1974	skull and bones	<sup>14</sup> C
	12. Meadowcroft Rock Shelter	16,175 <sup>±</sup> 975 (SI-2354)	Adovasio, et. al. 1977	charcoal	<sup>14</sup> C
	13. Smith Creek Canyon	12,600 <sup>±</sup> 170 (A-1565)	Bryan 1979	pine needles	<sup>14</sup> C
	14. Wilson Butte Cave (Idaho)	12,550 <sup>±</sup> 500 (M-1409)	Gruhn 1965	mammal bone	<sup>14</sup> C
	15. Tlapacoya I	24,000 <sup>±</sup> 4,000 (A-794)	Mirambell 1978	hearth	<sup>14</sup> C
	16. Valsequillo	21,850 <sup>±</sup> 850 (W-1895)	Irwin-Williams 1968	shell and bone with flake scraper	<sup>14</sup> C
	17. Taima-Taima Mastodon	12,980 <sup>±</sup> 85 (SI-3316)	Bryan 1978	masticated twigs	<sup>14</sup> C
	18. Fells Cave	10,720 <sup>±</sup> 300 (W-915)	Bird 1965	projectile point associated with horse and ground sloth	<sup>14</sup> C

\* Further evidence for the presence of very ancient people in the New World is the tarriance, in South America, of a paleoanthropine physical type, discovered as a fossil population at Lagoa Santa, Brazil (see Early Hominid Section).

EVIDENCE OF EARLY HOMINIDS IN THE NEW WORLD:

A SOUTH AMERICAN EXAMPLE

E. L. Davis

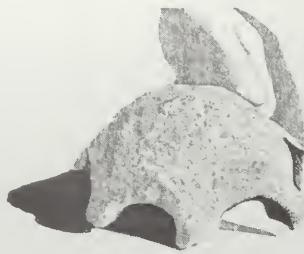
This essay is introduced into the sequence of the book because of its thought provoking quality: we must look further and seek new evidence if we are to discover Pleistocene Americans behind the endless evidence for Holocene Indians.

This essay does not "prove" that *Homo Erectus* specimens have surfaced thousands of miles south of California. The purpose of this chapter is first to call attention to the existence of unpublicized information at Lagoa Santa. Second, the essay shows that while well known human remains from Lagoa Santa caves are only 9,000 years old (and not fossilized)--the curious skulls that are illustrated in Figures III:5 and III:6 belong with assemblages of mineralized bones of humans and animals, jumbled together by amateur collecting. What really happened here? Bryan (1978b:323) calls this "controversial evidence that cannot be ignored."

Information in Bryan's Early Man in America (1978b) suggests the existence of a paleoanthropine population in South America. Two South American skulls are shown in Figures III:5 and III:6 (Bryan, 1978b:318-320). For comparison two cranial fragments from Africa--"*Homo habilis*" and a "*Homo erectus*"--are also presented (Figure III:7, see Brace, 1971:41). All four are wide, low-crowned heads with massive brow ridges and have a striking group resemblance although there are numerous internal differences. The African faces (from different excavations at Olduvai) have a continuous ridge of bone over the eyes, but the two South Americans (from



Frontal view of Lagoa Santa calotte



Lateral view of Lagoa Santa calotte



Frontal view showing few postero-lateral teeth positions of Lagoa Santa calotte



Posterior view of Lagoa Santa calotte



Interior view of Lagoa Santa calotte



Posterior view of Lagoa Santa calotte showing thickened posterior edge

After Bryan  
1978b:319.

FIGURE III: 5

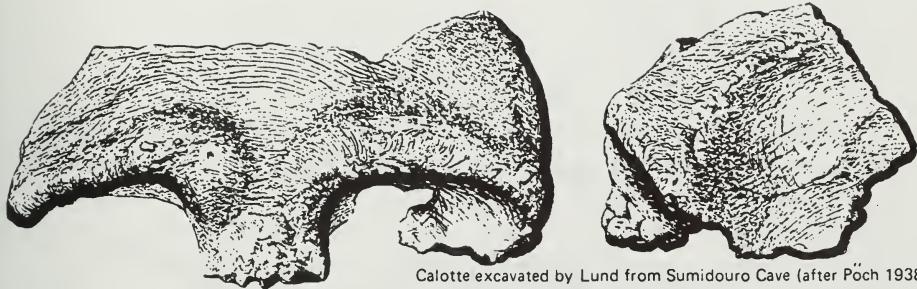
different excavations at Lagoa Santa) have separate, bony eyebrows. Both Africans and South Americans had noticeably broad, flat noses.

Rugose morphology alone cannot be used as a criterion for attributing great antiquity to a skull. In Australia, a Kow Swamp population with paleoanthropine cranial features has been dated to only 10,000 B.P. (Thorne and Macumber, 1972). However, both the degree of mineralization of the Lagoa Santa specimens, and their peculiar anatomy, set them apart as a distinctive local population that is different from the well-known "Lagoa Santa Man" of Sapiens sapiens type. That is, the Lagoa Santa Man population (of which many specimens have been collected during the past 100 years (Bryan, 1978b) had straight foreheads lacking an exaggerated supraorbital torus. Nasion, however, tended to be broad.

In contrast, the fossil Lagoa Santa population represented in Figures III:5 and III:6 (and in an additional group of fossil specimens being studied at the Museu Nacional in Rio de Janeiro) possess, as a group, unusual breadth and heavy buttressing of the supraorbital region. This massive architecture is accompanied by an exceptionally wide nasion with low naso-frontal suture (Bryan, 1978b:320).

The morphologically exaggerated population is represented only by mineralized bones. In the case of the Universidade de Minas Gerais skull (Figure III:5), the specimen was found in crates of fossil human and animal bones by Alan Bryan in 1970. The fossils had been excavated without stratigraphic control in the Lagoa Santa area by the late British consul A. V. Walter (who intended to sell them).

The skull shown in Figure III:6 has similar exaggerations of the supraorbital and naso-frontal details, is also



Calotte excavated by Lund from Sumidouro Cave (after Pöch 1938).

Figure III:6. After Bryan 1978b:319.

mineralized, and was recovered by P. W. Lund from another Lagoa Santa locus--Sumidouro Cave (Laming-Emperaire, A. A. Prous, A. Vilhena de Moreaes and M. Beltrao, 1976).

Bryan (1978b) suggests that the fossil population of Lagoa Santa was ancestral to the more modern Lagoa Santa Man people who did not inherit excessive supraorbital development but did retain a low naso-frontal suture. He also proposes that the anomalous eye and nose structure of the Lagoa Santa fossil people resembles both the previously discussed Kow Swamp (Australia) population of relict endemics (Thorne and Macumber, 1972, Figure 2) and the Mapa skull from South China (Howells, 1967:204).

While these similarities do not yet constitute unequivocal evidence, they support a possibility that (as suggested by Aigner, 1978) the Philippines, Japan, Australia and the Americas were, at a very early period, infiltrated by the expansion of a population pool in East Asia. Derevianko (1978:70) goes so far as to propose that the earliest discoverers of America probably belonged to the paleoanthropine stage.

These considerations all are illustrations of how little is known about the antiquity of Americans in general and, therefore, desert Californians in particular. What is the story of the expansion of our species over the globe and into this Western Hemisphere?

Detective stories begin with an incident and a clue. The strange skulls in South America may be a clue. What was the incident?

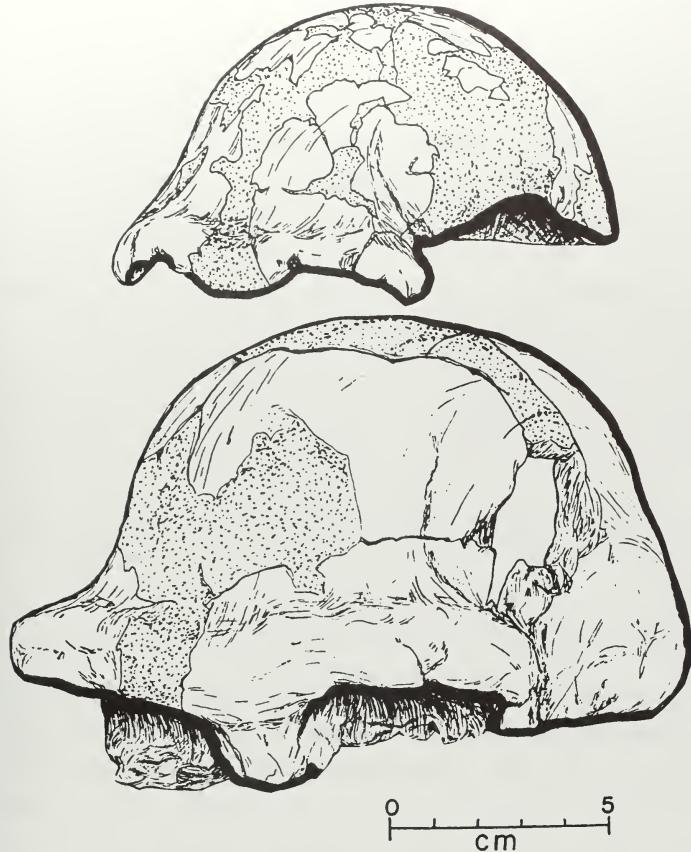


Figure III:7. After Bryan 1978b:319.

Designation: "OLDUVAI GEORGE"

(Olduvai Hominid 16, also referred to as "Maiko Gully", "George," "*Homo habilis*," and "*Homo erectus*" by various authorities, pictured with "Chellean Man" [Olduvai Hominid 9 which is a genuine *Homo erectus* skull].)

Dating:

Late Lower Pleistocene for "George" and early Middle Pleistocene for Olduvai Hominid 9.

THE NEW WORLD'S OLDEST DATE FOR  
MAN AND MAMMOTH

E. L. Davis, G. Jefferson, and C. McKinney

We are beginning to procure firm dates for Pleistocene kill sites in California: associations of PaleoAmericans and extinct animals. A new date of  $42,350 \pm 3,300$  years B.P. has been received. This is a Uranium series disequilibrium date on enamel from a mammoth tooth that was excavated in association with two sophisticated lithic flakes. This is the first secure evidence for the coexistence of people and the extinct Rancholabrean fauna in the basin of pluvial Lake China.

This date represents a major break-through in New World archeology: a firm time marker for the Ice Age antiquity of people in California. This date is supportive of other early sites that are, unfortunately, dependent on extrapolation of geological age for their archeological dating. These sites are:

- 1) Texas Street (George Carter)
- 2) Calico (Ruth Simpson)
- 3) Buchanan Canyon (Herbert Minshall)
- 4) Pinto Wash (Childers and Minshall)

This list enumerates only those early sites that particularly need vindication. There are many others. There seems little doubt that, once an unquestionable Pleistocene date for an archeological site has been published, dozens of others will appear.

During recent excavations at China Lake (Davis, ed.

1978a, 1978b, 1978c:Figure 80c:150), a fragmentary mammoth tooth and splinters of dentary were removed in a block of clay matrix. The block was cut free while excavating archeological test Unit D at the Basalt Ridge Site Area (Davis, 1978c:Figure 63c and Table 13). The sample was sealed in a can, labelled and shelved in the Department of Vertebrate Paleontology of the Natural History Museum of Los Angeles where it remained undisturbed for several years. Upon opening prior to preparation, the clay investment had dried and cracked into small pieces releasing its contents: an obsidian flake, fragments of mammoth tooth and dentary and a chert flake adhering to its own cast on a clay lump (Figure III:8).

The mammoth tooth and the two lithic flakes are definitely associated spatially and temporally. The clayey pluvial marsh deposit that contained them is tough, laminar in structure, moderately well indurated and overlain by a paleosol.

#### Archeological Setting and Context

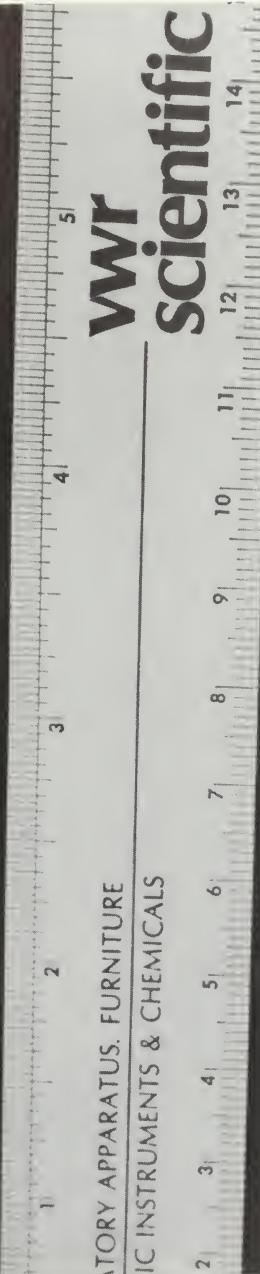
Test Unit D was one of twelve excavations at random points along a grid that extended about 100 meters in an east-west trend between Mammoth site #6 (cranial and tusk fragments weathering out at the surface above a dentary and two teeth) and Mammoth site #7 (an exposure of mammoth cranial fragments Davis, 1978c). The specimens from Unit D were recovered from a depth of 6 to 12 centimeters below the present surface. The excavation penetrated a layer of pavement and a calcic paleosol duricrust (dated at  $10,800 \pm 300$   $^{14}\text{C}$  years B.P., GX-3446). Below the paleosol were stratified layers of hard, greenish-white clay, inter-bedded with thin, reddish bands which yielded the specimens. This sediment was deposited near the shore of an ephemeral marsh that fluctuated with a sequence of minor changes in high levels of pluvial Lake China. Disarticulated fossils of other large extinct herbivores are common in this bed.



FIGURE III: 8. Obsidian and chert flake in matrix with mammoth tooth.  
U.S. dime (21mm) gives scale.



FIGURE III: 9 Superior view of tooth fragment. Ribbon like folds of enamel plates, (visible at right) are characteristic of mammoths.



LABORATORY APPARATUS. FURNITURE  
AND INSTRUMENTS & CHEMICALS

**VWR**  
**scientific**

Figure III:10. Lateral view of mammoth tooth. The animal was old and tooth wear was extreme.

The two flakes (Figure III:8) are both finishing flakes, products of the final steps of shaping stone tools by percussion. In percussion technology, the tool is sculptured to a desired form and thickness by reducing it flake by flake, with skillful blows from a hammer of elastic horn, bone, hard wood or tough, non-brittle rock. The ancient craftsman who worked at this site was probably performing several different butchering operations: cutting or slicing with a sharp, brittle obsidian tool and scraping or chopping with an implement made from tougher chert. Prior to burial, the flakes lay exposed for a long time--long enough for sandblasting to etch their surfaces so that hydration dating of the obsidian flake is not possible.

The Basalt Ridge Site Area, although promising, initially posed two major problems. The first fossil bones that were excavated were not associated with any artifacts. Second, the bones were leached of critical organic constituents and could not be radiocarbon dated. Furthermore, carbonate dates on the paleosol which overlies the fossils (GX-3446) were suspect because of contamination from dead carbonates transported by ground water. For these reasons, an experimental Uranium series dating technique was applied to the mammoth tooth enamel.

#### Discussion of the Mammoth Specimen

Mammuthus is represented by the posterior portion of a lower third molar (LACM-117751) (Figures III:9, III:10) and a number of isolated tooth plate fragments. The tooth is from a very old individual and extremely worn (height of the enamel plates is 2.8 to 1.3 cm, the total height is 4.0 cm). The posterior 5 1/2 plates are present; however, only the two posterior plates are complete. Four plates span 7 cm yielding a plate frequency of approximately 5.7.

Because the plates are farther apart at the base of the tooth, this frequency is anomalously low. The specimen compares favorably with the M. columbi, M. imperator, M. jeffersoni group, late Irvingtonian through Rancholabrean in age. This age is consistent with the Uranium series date.

#### Uranium Series Dating

The practicality of uranium series dating of vertebrates has been discussed elsewhere (Hansen and Begg, 1970; Szabo, Malde and Williams, 1969; Szabo, Stalker and Churcher, 1973). The use of enamel as a material for uranium series dating is based on the observations of its reliability vis-à-vis the unreliability of bone, dentine and cementum of known radiocarbon ages. This concordance was further studied by the analysis of enamel in various stages of fossilization and weathering using the gross specific gravity as a guide for usability (McKinney, 1977, 1978).

#### Method

The teeth samples are cleaned by hand washing. The enamel and dentine are separated by using small grinders and dental tools after a portion is cut from an undistinct area of the tooth. The enamel portion is prepared for analysis by removal of all visual dentine and cementum. The chemical and radiometric procedures are discussed in detail in Rosholt (1957) and McKinney (1977).

The analysis of the alpha spectra shows the activity of uranium and thorium isotopes per gram which are commonly reported as ratios of  $^{234}_{\text{U}}/^{238}_{\text{U}}$ ,  $^{232}_{\text{Th}}/^{230}_{\text{Th}}$ , and  $^{230}_{\text{Th}}/^{234}_{\text{U}}$  for age calculation. This type of dating demands a closed system. The conditions of this closure are: 1) the uranium is assumed to have entered the system shortly after the death of the animal during the decay process, and 2) the thorium 230 content is initially zero and only enters the system of

production from  $^{234}\text{U}$ . It has been shown that enamel has the greatest potential for dating when the specific gravity is above 2.95 and the structure shows no zonation (discoloration, obvious phases, etc.) (McKinney, 1977, 1978).

The material submitted for this analysis did have some zonation and specific gravity of 2.89 and therefore the results presented should be taken as a first approximation.

#### Conclusion

A calculated age of 42,350 years B.P. for the mammoth tooth enamel also applies to the obsidian and chert flakes encapsulated with the animal fragments. This age agrees well with dates on human remains from coastal California: a series of racemization dates on aspartic acid from human bone (Bada and Helfman, 1975:169-171) reading in years B.P.--before present--70,000; 46,000; 44,000; 39,000; 28,000; and 18,000. Additional racemization dates in this series (see also MacNeish, 1978:478) are 23,600 years B.P. and 17,150 years B.P. correlated closely with radiocarbon dates on the same specimens.

Table 5

Sample	Material	Sample Wt.	Uranium Concentration	U234/ U238	Th232/ Th230	Th230/ U234	Age
79E2	Mammoth enamel	0.7 g	5.32 ± .03 ppm	1.37 ± .01	218 ± 21	.32	42,350 ± 3,300

IV

## MACROLITH INDUSTRIES OF SOUTHERN CALIFORNIA

E. L. Davis, G. Carter, M. Childers,  
C. Hardaker, and H. Minshall

The macrolith industries described in this section are all "Teks"--basic units of technology--that are important conceptual elements in the ensuing sections. The Teks provide long cultural continuities--the warp in a chronological textile. Section V is a discussion and description of this Master chronology. The chronological model is then used as a theoretical fabric for archeological comparisons of the southern, central and northern segments of the California Desert.

This part of the CDCA report describes six little-recognized or replicated methods of stone-mass reduction into usable pieces. Each method was used by native Californians from time immemorial until European intrusion. Each method was specifically designed to make the best use of different natural forms (cobble, slab, boulder, etc.) in which raw material for tools occurs. These macrolith technologies appear to be New World continuations of Asian Paleolithic traditions. The purpose of the description is to involve archeologists in studying these more simple and less familiar macro-tool co-traditions of California in addition to the "prettier" stone arts of such Late Paleolithic crafts as the sophisticated artifact production of Lake Mojave/Clovis and San Dieguito III. Recognition of macrotechniques will aid in testing for the presence of Early Paleolithic peoples in the Americas. Archeologists at present are only trained to recognize bifacial shaping, percussion scarring, pressure finishing, and consistently patterned morphs like Clovis points and Desert side-notched arrowheads. Archeologists

are incredulous of the (unfamiliar) diagnostics produced in bipolar cobble smashing.

Introduction: A Question of  
Technology, Not Morphology

Stone tool industries of the California deserts remain controversial, uncorrelated and poorly defined. Common questions are 1) does this piece of stone represent human handiwork? 2) by what criteria can it be distinguished from the products of nature? 3) how old is it? 4) what is the ecological etiology of such an unstandardized object? 5) does it represent a culturally transmitted TRADITION of stone mass reduction or was the artisan sloppy and unskillful?

This first part of Section IV is addressed to question 5, presenting to the archeological community examples of unfamiliar traditions and products. Recognition of these objects, and the Lower Paleolithic methods by which they were produced, may open new and exciting avenues to prehistoric research. The questions must be addressed to technology not morphology (or "types").

In North America much is known about the refined stone tools of Paleo and Archaic Indians. These industries are identified by their core, flake and small tool traditions. In a word, comparatively diminutive flakes were desired for the production of delicately pressure-flaked implements of Holocene peoples. This progression is shown in Figure IV:1, a manufacturing sequence from prepared core to finished arrowhead. At the same time, more ancient, large-tool complexes have remained generally unrecognized. For historic and epistemological reasons, the United States has a strong resistance to recognizing its own Paleolithic traditions, the heritage of native Americans.



FIGURE IV: 1. This figure shows a complete series of steps, from core at right, refinement of the blank (lower center) to a finished, pressure flaked point (upper left).

In California, the pretty stone work of Clovis, Lake Mojave, Pinto and Archaic knappers is well known and widely replicated. In addition, we need a widespread recognition by scholars of macroflake stone industries, ageless in origin and yet so useful that they were continued until the introduction of steel and the beheading of the Stone Age arts in California. These industries lack such diagnostics as percussion bulbs and low fracture angles. Instead, square shapes and 90° angles are common.

Throughout the prehistory of the California desert area a number of methods were used to obtain huge but useful flakes with a minimum of energy, or even to explode an entire cobble with compressive impact. These methods were ageless and unchanged. Originating in the Paleolithic of Asia, they persisted, with no need for alteration, until the European Invasion. The macro-technologies are as follows, and were described by the following authors:

- A. Bipolar cobble splitting (compression fracture).  
This method causes unusual resonances and therefore atypical scars (Binford and Quimby, 1963; Borden, 1979; Carter, 1957, 1977; Minshall, 1976; Hardaker, 1979; Davis, 1973). The general appearance of bipolar is shown in Figure IV:2.
- B. Boulder hurling (free smashing) or block-on-block (Davis, 1973:3) (see Figure IV:3).
- C. Macro-flake removals from a free standing mass (Figure IV:4).
- D. Macro-flake removals from half-buried boulders (cone and ridgeback production) (Ridgeback: Childers, 1977a; Cone: True; 1966, Plate 3a).
- E. Macro-Levallois technique (derived from cones and ridgebacks) (see Figure IV:5).



FIGURE IV: 2

Bipolar cobble splitting is harder to identify than is free-percussion flaking with production of symmetrical bifaces. Clues to human workmanship are faint in this picture but are nevertheless visible. Arrows point to (very dim) bulbs of percussion.

F. Use of tabular slabs for casual tool improvisation  
Davis, 1970, Panamint) (see Figure IV:6).

Our first purpose is therefore to describe and illustrate the six simple (yet knowledgeable) methods of mass reduction for flake or tool acquisition that are enumerated above. Technologies A and C frequently do not have the usual flake characteristics of percussion bulb, rays of impact and conchoidal rings. Instead, their detached surfaces are often smooth and seemingly amorphous while those bulbs which occasionally appear are located centrally rather than proximally on the fracture planes. These are pseudo-bulbs or compression bulbs produced by resonance of a rebound force from the massive anvil (Figure IV:7). Particularly in bipolar work, there appears to be an impact between the last shock wave of the hammer blow and first return waves from the resisting anvil. In contrast, percussion flaking does not offer the same resistance to shock so that in either free-hold or punch work, the impact energies are able freely to escape.

Secondly, we see that the only solution to questions about the techniques, antiquity and cultural associations of macroflake tools will be expenditure of funds, energy and expertise to investigate southern California coast and desert sites where macrolith industries are found. We need another interdisciplinary attack on a problem comparable to Tule Springs. At present the macrotraditions are neglected and avoided in favor of easier and more fashionable problems. In this respect, the integrity of science is at stake. Concentration of effort, like the efforts at Tule Springs, will be needed to answer such questions as: who were the people who left Pleistocene burials at Del Mar and Yuha Wash? What natural forces could possibly have fabricated the tools at Texas Street, Buchanan Canyon and those deeply buried in

## Pinto Wash?

In short, despite a mushroom crop of academic studies of small tool traditions, the macrotraditions, which may represent our longest trail into prehistory, are rejected as products of earth pressure, hydrolysis (frost spalling), fire or stream action. Archeologists must experiment with boulders and cobbles, thereby coming to recognize human workmanship in unexpected forms and unexpected places.

### A. Bipolar Cobble Splitting:

#### A Compression Technique

The bi-polar technique was first reported in 1957 by George Carter, who observed a small, recessed hearth (with charcoal and fire-reddened rocks) together with cobbles that had evidently been divided by an unknown method. The geological matrix was a Wisconsinan riparian section. Experimenting with similar cobbles of quartzite and metavolcanics, Carter taught himself to replicate bi-polar, compressive cobble fracture (Figure IV:8) by placing the cobble on a large anvil stone and cleaving it simultaneously into a number of parts by a blow on the apex with a hand-maul. The maul-blow and anvil-rebound forces compress the spherical object, literally exploding it into sections. A variety of morphs is created by this opposition of forces within an imperfect but elastic material. The forms can be grossly classed as either parallel slices (like a loaf of rye bread) that are ideal for knives; or the far more common, irregular shatter flakes shown in Figure IV:2. All have sharp edges and are immediately useful with no modification.

This technology is of Lower Paleolithic age in Asia, having been used at Chou-Kou-Tien Loc. 1 (Kobayashi, 1975: 115). It is also varied in its application as well as occasionally sophisticated in concept. Polyhedral cores are



FIGURE IV; 3

Reassembled pieces of an andesite boulder fractures simultaneously by hurling it upon a half-buried anvil.



FIGURE IV: 4. Parent boulder and detached macroflake.

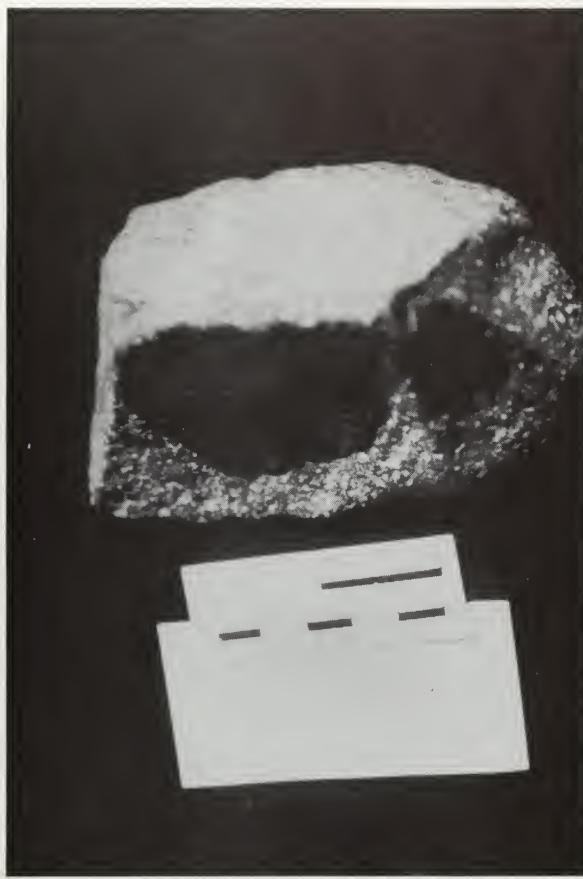


FIGURE IV: 5. Yuha Burial. Dorsal view, Levallois Ridgeback II.



FIGURE IV: 6. Tabular slab compound tool. The two spokeshave notches (right) are newer than the chopper flaking on the left. Provenience: a jasper workshop on the shore of Lake Lahontan near "Two Chimneys".

examples. They are illustrated by Kobayashi (1975:Plate 6D) in experimental work. Polyhedral cores were recognized by Ranere (1975:Plate 2, middle and bottom rows; Figure 2:183) from Chuiqui River assemblages in Panama. North China and Panama are far apart, implying great age and wide dispersion of cobble-reduction procedures.

The experiments of Barnes in 1939 are misleading when applied to the products of bipolar cobble splitting. Barnes tumbled rock in a chute but did not subject round cobbles to specifically directed, compressive blows. Therefore he did not discover that 90° fracture angles (that create orange quarter shapes) are a diagnostic of the bipolar technique. I doubt that Barnes or any other archeologist who mistakes bipolar fracture for "natural accident" has ever stood beside a mountain stream in flash flood, listening to the continued growl of rocks tumbling one over another, grinding each other rounder and rounder.

Archeological recognition of these processes and their products is narrowly distributed, to the detriment of identifying arcane human activities in California, as well as the Asian Paleolithic traditions from which these continuities derive. However, these oversights are easy to understand. The shatter-products of splitting cobbles look, to the untrained eye, like haphazard junk. The "busted rocks" bear little resemblance to autographed work of pretty-tool knappers. Smashed cobble detritus appears fortuitous rather than controlled. The artisans broke cobbles into whatever fragments a sledge-hammer blow might produce. The woman or man at work then picked over the scrap, selecting whatever flakes or chunks might be suitable for the tasks at hand.



FIGURE IV: 7. Bipolar split cobble with pseudo-bulb at one side.

Curved or Circular Cortex Spalls of Quartzite. Alteration by weathering of 1-2 mm of surface may predispose this layer (different in texture from the cobble body) to detach readily. Agencies that produce such detachment are suggested to be both human and natural. Human causation could be transmitted shock, associated with a flake removal blow, which might produce the curved spalls. Frost or fire strains induced in the cortex may produce stress-peeling of the cortex. Experiments are needed to test these propositions.

Half or Hemi-Cobble Work. Impact abrasion on the top ridges and bottom platforms of halved (hemi) cobbles indicate compressive work between maul and anvil (Figure IV:9). Flakes are detached from the flat bottom upward, "the base resting on the anvil produced multiple cones from the basal area" (Binford and Quimby, 1963:288 and Figure 127). This operation undoubtedly produced some of the "scraper planes" of southern California cobble industries.

Anvil Characteristics. Work scars or abrasion are also visible on the large anvil stones of a cobble work-shop. Scars appear as abraded dents that pock the anvil surface. Relative scale of a pocked anvil, incipient polyhedral core (and/or maul?) together with flake debris are shown on a Cedros Island site off Baja California (Davis, 1973:Figure 2). Cobbles are of metavolcanic materials.

Criticisms of the Human Origins of Cloven Cobbles. George Carter's cobble industries deep in Pleistocene deposits at Texas Street (1957) have been attacked as "Carter-facts". Critics who neither observed nor experimented attributed the cracked cobbles to natural agencies such as a) brush fires, or b) earth pressures from an immense overburden. Experiments of Carter (1957), Minshall (1976), and



Figure IV:8. Bipolar, cobble-split technique. "Rye Bread" slices made experimentally by Chris Hardaker.



FIGURE IV: 9. Bipolar simultaneous technique, top and bottom flaking, hemi-cobble.

Hardaker (1979) demonstrate the feasibility of maul-and-anvil cobble work. Reports of many La Jollan sites and my Cedros Island photograph cited above leave no doubt that native Californians made extensive use of the technology. However, a full range of experiments that simulate natural stresses are also needed.

Bone: An Experiment in Bipolar Splitting. Bone responded to compressive fracture in a way comparable to stone --sudden compression augmented by opposed resonances literally blew a heavy beef femur apart in longitudinal strips above and below a lateral break in the center of the diaphysis. The femur used for this experiment was clean, dry, but still green (Figure IV:10).

An Outstanding Product: Polyhedral Cores. Polyhedral cores for production of true blades are known in the Mission Valley of San Diego, in the Yuha Desert and have been excavated from depths greater than 200 inches (16.67 ft.) or 5.05 m in Master Pits at the Calico Site (shown in "Central Desert section"). A particularly beautiful and sophisticated offshoot of the bipolar-compression principle is the polyhedral core from which a series of true blades (flakes at least twice as long as they are wide) have been removed. Shock waves induced at the proximal end of a core by the hammer blow can produce removals which are thin, smooth of surface with no bulbs, conchoidal rings or resonating features, and with distal ends that feather out (Figure IV:11). In contrast, removals that are produced by rebound force from the anvil are shorter, thicker, and hinge off abruptly at a point where echoes of the initiating shock waves are encountered. This encounter of opposed forces creates a lateral component of wave travel, producing a hinge fracture. Polyhedral cores were developed both from elongated cobbles and also from massive slabs, 6-12 cm or more in thickness.



FIGURE IV: 10. Bipolar bone split of beef femur.

Polyhedral cores are an ancient tradition that can be traced to the Lower Paleolithic of China at Chou-Kou-Tien. The tradition has survived from the Paleolithic into Holocene or Proto-historic centuries in California (Figure IV:12).

Carter (1957), Minshall (1976) and Hardaker (1979) have recognized polyhedral core-and-blade technology in the San Diego area but find the procedure difficult to reproduce. Conventional archeologists have disposed of the problem either by not "seeing" the cores or by attempting to explain these stone masterpieces away as 'natural products'. This is statistically about as likely as criss-crossing snail tracks drawing the plan and elevation of a Klein's Bottle.

Bipolar, polyhedral cores at the famous Calico site have been found from present surfaces down to a depth of 216 inches in the excavations (see Figure VIII:3) (Ruth D. Simpson, personal communication, 1979). I have studied and photographed these Calico specimens and found them to be indistinguishable from polyhedrals of both slab and cobble derivation that are found by Childers in the Yuha Desert, by Carter at Texas Street, by Hardaker on the surfaces of coastal sites in the San Diego area, and by myself at Little Lake (Mehringer and Sheppard, 1978:153-166), see Figure IV:13.

Bipolar technology is not clearly recognized by archeologists and is generalized under a rubric of "pebble-tools". Borden (1979) mentions choppers and pebble tools in the Pacific Northwest but without clarification or description and Fladmark (1979:41) lists four pebble tools from Skoglund's Landing site and includes a "pebble flake core". No indication is given whether the flakes were produced from bipolar compression or whether the pebble core might resemble the sophisticated polyhedral cores of southern California. Bipolar technology has been too-long neglected by flint



FIGURE IV: 11. Polyhedral blade core developed on a quartzite cobble. Radiating lines of force are detectable on both flake scars but are difficult to read because of the damping effect of the bipolar technique.



FIGURE IV: 12. Morlin Childers' collection - 1979. Polyhedral core from Yuha Desert, El Centro.

knappers. It will reward a thorough investigation.

#### B. Boulder Hurling

Boulder hurling is a free-hand way of splitting large masses of rock (e.g., those weighing 15-20 kilos or more). It was suggested by Don Crabtree (personal communication, 1969) as an alternate to the compressive, bipolar technique (see also Davis, 1973:4). Bipolar is only practical when a slow, heavy blow can be delivered to a cobble not exceeding 2-3 kilos in weight.

To smash a massive rock, a very large and stable anvil is required--preferably one that is half buried. The core rock is swung overhead by the stone-worker, who then throws it down on the anvil with all his strength assisted by gravity. When the core-rock fractures, it does so in an uncontrolled, unpredictable manner like a mussel dropped on a ledge by a seagull.

#### C. Macro-flake Removals from a Free Standing Mass

Figure IV:4 illustrates a widely practiced process of striking large flakes from free-standing boulders.

#### D. Macro-Flake Removals from a Half-Buried Boulder

This technique produces ridgebacks (Childers, 1977) and enormous cones (Figure IV:14) (True, 1966: Figure 3a) at the apexes of half-buried boulders that have been used as cores. Childers discovered that the tops of boulder cores were frequently driven off after macroflake removals had reduced the parent mass to a narrow ridge or cone surrounded by giant flake scars. At this stage, the core had to be rejuvenated by making a new striking platform. To do this, a massive cap



FIGURE IV: 13. Little Lake house rings, polyhedral core, Basalt macroliths.



FIGURE IV: 14. Yuha Desert, Childers' Collection, Macro-Levallois (core).

or shield had to be knocked off the boulder's crown--an operation requiring a big stone punch (resembling a pestle) and a hand-maul. The resultant shields are common in the Yuha Desert and were found interred with the controversial Yuha Burial (Bischoff, and others, 1976:128-129; Bischoff and Childers, 1979). Since they have been overlooked by most archeologists they merit a special description. The burial has been critically discussed by Payen, and others (1978).

#### E. Macro-Levallois Technique

##### Derived from Ridgebacks and Cones

Only Morlin Childers (1977a) has observed and described Macro-Levallois technology and its ridgeback by-products. The resultant "caps" ("ridgebacks") or shields that are driven off an exhausted boulder (in order to restore its core function) are unique in shape. They are very easy to identify once an archeologist's understanding of the production stage they represent allows them to be recognized. The caps are flat on the bottom and either pointed or ridged on the top. The apex is surrounded by a number of macro-flake scars that originated from striking platforms around the boulder's crown. The macro-flakes resemble faceted hats of considerable size--the flat bases frequently measure 10-18 cm on their long axis.

#### F. Tabular Slab Tools (Figure IV:6)

Natural slabs of rock provide convenient blanks upon which working members such as beaks, planes and cutters or scrapers can be shaped. Tabular structure is not uncommon in metamorphic and volcanic stone, the latter being frequently andesite and flow-laminated basalt.

Tools made from these substances did not, in California,

represent consistent industries. Rather, they were a tactic that was ubiquitous--known and used by any Stone Age adult who happened to be working in an area where the "country rock" consisted of tabular material hard enough to hold an edge. Figure IV:6 shows this casual and opportunistic class of tool. It is well represented at Calico.

In July 1979, Jacqueline Nichols, Clay Singer and I re-examined artifacts from the Calico Site. Some of the large implements are excellent examples of these slab-or-chunk tools. If U.S. archeology is ever to advance beyond Archaic phases of prehistory (we consider Clovis as an introductory Archaic industry) then archeologists must learn to recognize non-morfs (tools with fortuitous outlines). Non-morfs are natural stone lumps with humanly-fabricated working members such as edges, beaks, spokeshave concavities, etc.

#### Summary

Solving the time/culture/geology correlations of California macro-technologies can only be approached by investigators with adequate funds and interdisciplinary back-up teams of superlative skill.

Primarily the "time" of the technologies must be assessed within a geological-climatic framework within which we should prepare to reach far back into the unknown. Time might be measured in six figures. Geochronologies of lakes, lake-swamps, dunes and, particularly, the artifact-bearing paleosols are the best means of building valid time structures for early New World prehistory.

Only studies posited upon geoarcheology can slowly unravel the problem. At the same time, the six little-known macrolith technologies described above are keys to the

diversity, sophistication and time-depth of ancient stone-reduction procedures. The techniques were so useful as to be virtually immortal. They did not go out of style like fluted knives, for example. Instead, once the macrolith reductions were invented, they continued as viable traditions until the California Stone Age was eradicated with steel and gun powder. Macrolith traditions may form an unbroken continuity from the Paleolithic of Asia. Our problem is to trace this continuity.

Alan Bryan (1978:314) wrote, "I believe that the main reason why most of the objects from Texas Street and Calico look to us like only broken rocks is because we are unable to recognize the flaking techniques that were applied to those rocks."

V

A REVIEW OF CALIFORNIA DESERT PREHISTORY  
AND A PROPOSED MASTER CHRONOLOGY

E. L. Davis

Time, Environment and  
Cultural Taxonomy

The archeological taxonomies of southern California Desert areas are a jungle when viewed through the eyes of casual readers. First, a number of people have worked out paleocultural seriations for the region, each archeologist taking a slightly different point of view. Second, the criteria used as building blocks differ with each worker and his product--(his scheme for placing the cultural scraps we call "archeology" in a temporal sequence). The following investigators have all contributed cultural chronologies for the lower Colorado River and surrounding regions. The pioneer of Colorado Desert archeology was Malcolm Rogers, director and curator of the San Diego Museum of Man. In 1939 (after years of field work), Rogers published "Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas." Confusing, incomplete but still a milestone, this article opened a door upon spaces filled with controversial stone objects, nebulous time scales, broken sequences and geological/climatic events that were poorly understood. Subsequently, other prehistorians have contributed to studies of the large desert areas of southern and eastern California. The time scales most directly applicable to our own work have been developed by Rogers (1939, 1950); the Campbells (1935, 1937); Hayden (1976); von Werlhof, et al. (1977); Weide (1974); Wilke (1978); Childers (1978); Warren (1967); Warren and Ranere (1968); Davis (1978a, 1978c).

Numerous criteria are used in building models for archeological sequences. Available components are of various degrees of theoretical significance, comprising taxonomic concepts as different as language, ethnic background, place names, stone tool shapes (Morfs), and technologies (Teks). Since these noncomparable intellectual categories are frequently mixed with each other, then enriched with sections of geological/climatic frameworks, spiced with environmental change and stirred in a blender--unwary readers are left frustrated--an undesirable situation at best. Frequently the architect of a cultural chronology shifts modes from one conceptual framework to another as the available data change from an ethnographically known linguistic group (e.g., Yuman) to a handful of heavily weathered rocks that can be recognized as culturally attributable only after exacting study (e.g., "San Dieguito I"). Another example is the "Malpais" tools of Hayden (1976); Rogers (1939; 1966) and von Werlhof (1977). "Malpais" translates from the Spanish literally as Badlands--water-abandoned pavements; sculptured gullies; Pleistocene shore traces encrusted with tufa and windswept banks of dry washes. The Badlands have produced countless bushels of skillfully-made artifacts representing Teks of great antiquity that link New World traditions with those of Asia (the Macrolith Industries described in Section IV). The nature of these linkages is at present unknown but should be investigated. Malpais is a useless, conceptual mish-mash that should be cleaned up or discarded. It applies the name of physiographic province to a heterogeneous disarray of stone artifacts that are heavily weathered, un-analyzed and "old". (How old is "old"?)

A list of the conceptual units I have used in assembling archeological sequences includes the following ideas expressed in micronyms: Morfs (tool shapes); Teks (systems of

fabricating useful objects); Stets (names of places where classes of objects were first discovered); Kits (assemblages of human-use objects that commonly occur together); Osts (bones of fish vs. birds vs. mammals that characterize a site) or Liths (kinds of stone such as volcanic, silicate or glass that are peculiar to different kinds of regional archeology). This micronymic word game is merely an exaggerated example of what the chronology builders are doing anyway (along with everybody else).

Small wonder that chronologies are trackless forests unless simplified to minimum factors. In the lower Salton Trough, repetitively comparable factors are: A) Environments (forests; presence or absence of a lake), and B) Teks (archeologically visible technologies for producing useful objects such as pottery or stone tools).

Morlin Childers (1978) has produced a simple and internally consistent chronological sequence for the Yuha (southern Salton Trough) region by describing five phases of stone-tool production characterizing the Imperial Valley and Northern Baja California. I have used this in part for constructing the CDCA Master Chronology, adding a slightly different, technologically based sequence that is applicable to the entire desert. Two other concepts are added to Childers' series: a) that many of the ancient stone mofrs were designed for working wood, and b) that this proposition allows us to use Van Devender's recent (1979:705) information on Quaternary presence followed by Holocene disappearance of low elevation woodlands in the Southwest. A premise that there was a 1:1 relation between the forests, the climate that supported them and stone tools can be a powerful tool for correlating and seriation: e.g., woodworking tools on a low-elevation at a quarry or camp probably dates the site as at least 11,000 years old.

An underlying assumption is that early cultures are ecological adaptations. They are best identified through technology rather than linguists, place names, raw materials, or other limited criteria which often make taxonomies non-comparable. For a fuller discussion of the problems of cultural chronologies and the etiology of the one used here, see Section IX of this report, a discussion of the Panamint Basalt Quarry.

It seems that the basic concept of wood-working versus non-wood-working Kits may have great interpretive value for two purposes: first for understanding early, rough tools that contrast with later, refined tools and second, for understanding how beautifully these two classes of Teks express human adaptation to a Pleistocene landscape with trees (see Van Devender and Spaulding, 1979:705, Whipple and Turtle mountains) followed by Holocene re-adaptation to a desert landscape without trees.

The cultural taxonomy, shown in Table 10 for the Yuha area, is based on a premise that stone tools will probably change with changing eco-adaptations of the people who make the toolkits. In this case, I infer that large tools having only the actual working edges developed are characteristic of Pleistocene site scenes of desert California: Master Pit 2 at Calico (Schuiling, 1972, 1979) and deeply buried strata in Pinto Wash (Childers and Minshall, 1980, in press). These tools of Lower Paleolithic appearance are postulated to have been useful in working wood as well as digging and preparing coarse roots and tubers. This premise allows us to correlate toolkit competence with known Late Pleistocene/Holocene climatic cycles in the southwestern United States. Van Devender's recent article in Science (1979:701-710) permits experimental correlation of the presence of pinyon-juniper forests along mountain/desert interfaces with presence

# CDCA MASTER CHRONOLOGY

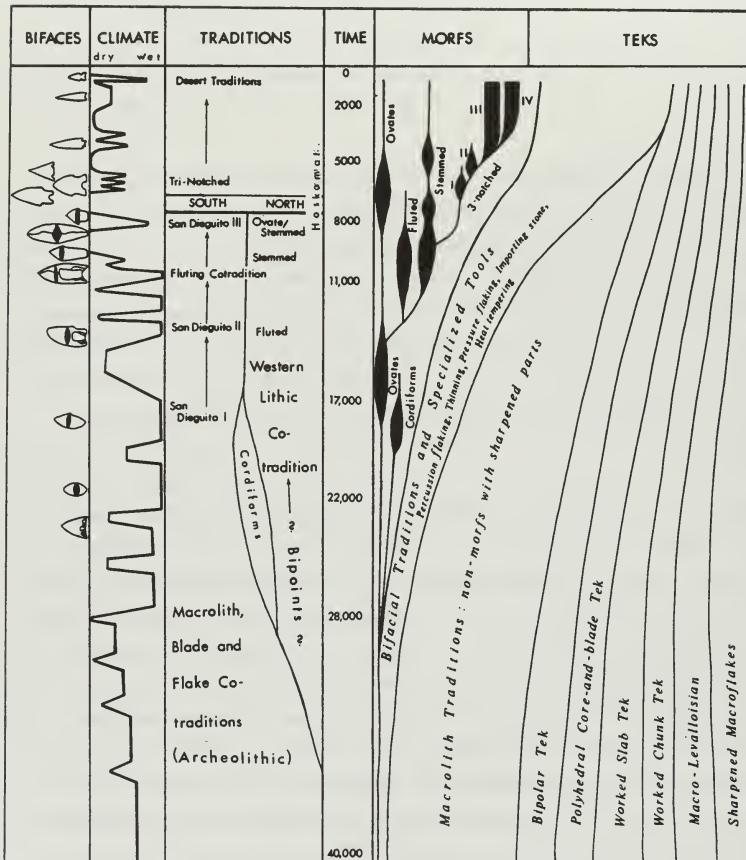


Figure V:1 A chronological system for desert floor archeology in California.

of large and generalized wood-working tools between 22,000 years B.P. and 11,000 years B.P. Between 11,000 and 8,000 years B.P., low elevation mountain communities of mesophytic plants disappeared. Concurrent disappearance of large, wood-working tools would be expected at the same time. At this transition greater tool refinement and greater extractive intensity should also become visible.

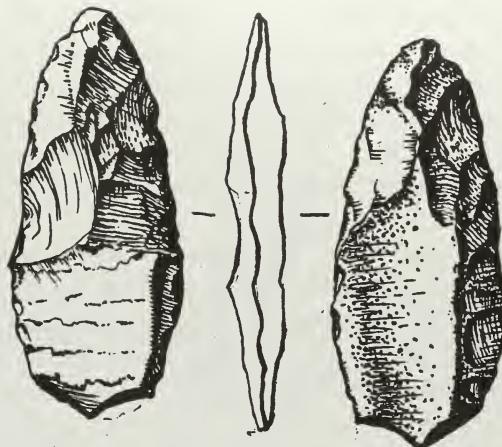
Retreat of woodlands to mountain summits accompanied by appearance of full desert conditions after 8,000 B.P. should be archeologically reflected in expansion of small-tool diversity accompanied by a more eclectic exploitation of both industrial and food resources.

Criteria for a Master Chronology are that it should combine time, environmental changes, the San Dieguito successions designed by Rogers and Hayden for the southern deserts; the Campbells' Pinto Basin and Lake Mojave complexes of the central desert; Warren's expansion (1967) of the San Dieguito taxon to include Lake Mojave, Panamint Valley, etc. All these systems, however, fail to recognize and discuss western Clovis morfs and teks. This oversight completely obscures the nature, qualities and frequency of Fluting Co-tradition expressions in the northern desert. Western Clovis was suggested to be a Lake Mojave/Clovis blend, a peak phase of the Western Lithic Co-tradition by Davis, Brott and Weide (1969). Warren and Ranere (1968) called attention to a post-Clovis, northern intrusion of lithic traditions into the Mojave Desert. These intrusions (after about 8,000 years ago) became visible as new morfs and teks that derived from "Haskomat" or "Cordilleran" traditions (Butler, 1961) of post-glacial tool making in Idaho and Nevada (Figures V:2a, 2b; V:3; V:4; and V:1). All the above authors view these problems from different directions.

Panamint Valley, North Basin Iny-20

L-7.3 W-3.1 T-0.8

FIGURE V: 2a

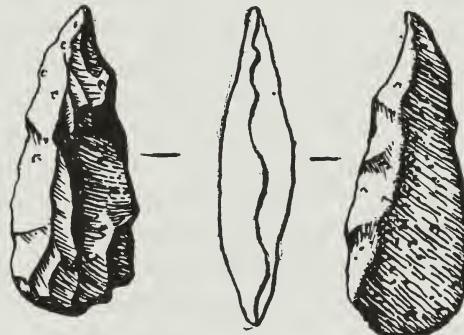


(Pot hunter excavation)

Type I basalt (Weide '69, Fig. 36a)

## Western Lithic Co-Tradition

FIGURE V: 2b



Panamint Valley, North Basin Iny-20

(pot hunter excavation) L-5.6 W-2.3 T-0.9

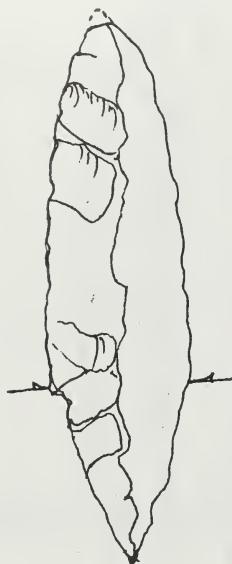
Type II Basalt (Weide '69, Fig. 36b)

SEARLES LAKE QUAD. CA. R 42 E

T 27 S, Sec. 25 or 36 L-9.7 W-2.5 T-1.7

San Dieguito Point. Obsidian

Pot Hunter



(Has slight blend of 3 styles: San Dieguito - long, thick, narrow  
Lake Mojave with faint shoulders - Gypsum with pointed base)

## San Dieguito III

FIGURE V: 3

Site area M-184 (W. of Twr. 10) China Lake  
L-14.5 W-3.4 T-1.3 Knife/Point Obsidian  
Krenzel Collection China Lake



This is a remarkable specimen, with a surprising resemblance to (I think) a "Solutrean laurel leaf point"

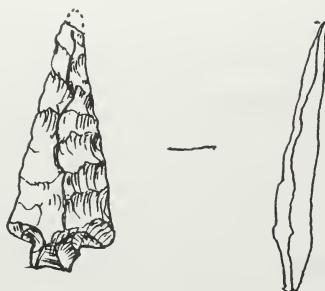
## Cordilleran- or Haskomat

FIGURE V: 4

China Lake/Stake 24/Quad D/-20

L-4.4 W-1.8 T-0.6

Milling Archaic knife/point



Heat-treated chalcedony

Flake scars fresh and crisp, very little sanding

## Desert Traditions

FIGURE V: 5

Desert Floor Archeological  
Chronology for CDCA

In other sections of this report, a number of bits of information in three regions are presented: spot studies of areal archeology in the southern, central and northern deserts and observations about the geological and climatic situations that form an archeological matrix. Now the pieces must be joined in a synoptic diagram shown in Figure I:3. Applications of the diagram are shown in Figures VII:7, VIII:1 and IX:60.

What do they all mean? I think that, at this point in our desert work, we can put together a sketch of an outline for prehistory of people--at work and at worship--in the California Desert Conservation Area. The sketch is piece-meal and wobbly, like the Giant Ground Figures (Davis and Winslow, 1965) that supply one of its most imaginative elements. We are attempting to interpret a four-dimensional, broken-up pictogram made from fragments of past landscapes marked by scraps of artifacts, and of inscriptions (little circles or ground figures).

The artifacts are eloquent. The decomposition of their substance has a lot to tell us and so does each point in space where we find them because the points are ephemeral fixes that we catch in time and change.

For an archeological observer in these vast deserts nothing is certain except uncertainty. "Dates" are a folly in such a context. However, the flow of geological/climatic episodes can be reconstructed and human events can be fitted into the shape of climatic cycles on the basis of probability that starts with WATER:

water = plants = animals | Σ = people.

Prehistory in these deserts did not begin with Clovis. Some regions--the southern and central areas--were either little affected by Clovis high technology or else its manifestations remain hidden beneath deep alluvium. Human habitation of the entire desert floor (particularly of interfaces with marshes along drainages and catchment basins) began at some unknown time during the Quaternary: 100,000 years ago? 200,000 years ago?

New geoarcheological observations at Calico indicate that human foragers were present during a Marine Isotope Stage 5 between 80,000 and 125,000 years ago (Roy Shlemon written communication, 1979).

This geological estimate of human time-depth in the CDCA makes the chronological diagrams in this report extremely conservative. The 40,000 year time estimate is based on two propositions: 1) that already-ancient Macroflake Traditions of stone-mass reduction ("TEKS", described in this Section) were introduced from Asia in advanced stages of development; 2) that "MORFS", (shapes that are products of technical and esthetic specialization) changed slowly until about 20,000 years ago, accelerating in complexity after 15,000 years ago.

#### Some Considerations for a California Chronology

In order to propose a master chronology, the stonework on which it is based must be broken into subsets and critically evaluated as follows.

1. Means of shaping (Teks).
2. Appearance of the shape achieved (Morfs).
3. Cultural connections (if known)

4. Naming or labelling (a history of archeological opinion).

An inspection of the photographs and drawings in this report and consideration of the labels applied to these objects shows a basic confusion that is part of the California archeological heritage.

Confusion 1: comparable morfs produced by different teks.

Confusion 2: comparable morfs (such as leaf-shaped knife/points) with different labels (e.g., Lake Mojave, San Dieguito, Cordilleran, Haskomat, Lerma, Western Lithic Cotradition, Sandia [see Table 6]).

At this stage of organization, the object of the report is to point out the existence of confusions and their nature. If we see them, they can be solved.

TABLE 6

LABEL/MORES PROBLEMS OF CLASSIFICATION

<u>LABEL</u>	<u>MORF</u>	<u>Pointed end/ Round end</u>	<u>Pointed each end</u>	<u>Stemmed/ one shoulder</u>	<u>Stemmed/ two shoulders</u>	<u>Tapered end/ long tang</u>
Lake Mojave	X		X	X	X	X
Sandia		X		X		
Lerma		X			X	
San Dieguito		X	X		X	
Cordilleran	X		?			X
Haskomat		?			X	X

TABLE 7

CRITERIA FOR EVALUATING STONE ARTIFACTS

(Note: Teks are defined as basic techniques for shaping stone.)

A. Purely Lithic Criteria

- <sup>A</sup>1. Means of Primary Reductions (None) (Bipolar) (Polyhedral) (Boulder Hurling, Levallois, Macroflake) (classifiable as Teks).
- <sup>A</sup>2. % Secondary Shaping (working member only) (% one side) (% both sides)
- <sup>A</sup>3. Means of Secondary Shaping (None) (Bipolar) (Block on Block) (Percussion) (Pressure) (classifiable as Teks).
- <sup>A</sup>4. Preferred material.
- <sup>A</sup>5. Importation of preferred material.
- <sup>A</sup>6. Heat treatment.

B. Non-Lithic Criteria

- <sup>B</sup>1. Geological Association (lacustrine) (alluvial) (aeolian) (spring) (soil)
- <sup>B</sup>2. Time (Deposit of patina; sanding; water rolling; chemical/physical alteration).

C. Esthetic Criteria

- <sup>C</sup>1. Diagnostic (e.g., repetitive) morfs. (A morf is a recognizable unit of shape.)

D. Cultural Criteria (when known)

TWO (OVERSIMPLIFIED?) MODELS: PEOPLING AMERICAS

Originally presented at the XIV Pacific  
Scientific Congress

E. L. Davis

Writing a comprehensive chronology of Early Human Activities in the CDCA is the most difficult part of this report. I shall therefore begin by outlining three possible kinds of time scales for the migrations that brought Asians into the Americas. The first two opinions [Turner (1979) and MacDonald (1979)] limit the arrival to a few scores of thousand years ago. The proposal of Davis is a bold counter-view: two skulls from Brazil suggest hundreds of thousands of years for hominid specialization in eastern Asia and subsequent dispersion to the Greater New World--that is, BOTH Australia and the Americas.

There is too much we do NOT know about the prehistory and hominid developments of China and the Soviet Far East.  
At present, funds and attention are focused on Africa while the dramatic scenario of the physical and technological evolutions of Asian and New World peoples remain neglected.

1) Chris Turner - Dentition Criteria

- a) Sunidont dentition: a Southeast Asian development
- b) Sinodont dentition: China and all American Indians, a Northeast Asian development identified by shovel incisors and idiosyncratic first molar roots. Further subdivisions within the living and previous AmerIndian populations suggests three (3) waves of migration to the Americas from Asia.

First Migration: (time unknown) Terminal Wisconsin drift to north and south America.

Criticism: rapidity of migration unknown. If fast - why? If gradual - why no perceptible differences developed in dentition among widely scattered PaleoAmerican groups since human evolution is a continuous process?

Second Migration: (about 10,000 B.C.?) Eskimo-Aleut spread into Boreal regions and closure of easy access.

Third Migration: (? ?) Nadene speakers (Athabaskans, including ancestral Navajo-Apache groups.)

Comment: if Nadene speakers were the last group, how did they penetrate the Eskimo-Aleut circum-polar block? If Nadene earlier - why is this language group so narrowly distributed?

Del Mar Observation: there was an unpublicized child's burial (or remains) with the Del Mar skeleton. The child's dentition is indistinguishable from Hopi (Sinodont) type. This means Sinodonty must be very old since it has changed so little in the past 48,000 years.

2) George MacDonald (Canadian Natural Museum)

- a) He accepts Turner's model for recent (Eskimo-Aleut-Nadene) but thinks that "all other previous Indians" were migrants WHO DID NOT SURVIVE.
  - i) very small groups
  - ii) poorly equipped technologically
  - iii) unable to adapt (see below)

Questions: If they were not adapted for survival,

how did they manage:

- a) to cross through Boreal regions;
- b) to penetrate as far as the Southwest Deserts (Yuha and Pinacate) and to Venezuela, where they killed the El Jobo mastodon with an ovate point, before 13,000 B.P.?

Clovis Conquest: During this period (12,000 B.P.) there was a massive invasion of well equipped and successful hunters. The model does not say WHO or WHENCE. . . .

- 3) E. L. Davis Model: This model must allow great amounts of time for slowly advancing, leading edge of Northeast PaleoAsians (see Table 8).

#### Physical Types:

Early Asian types may have evolved from erectus into sapiens without a recognizable Neanderthal interval. Only identified exceptions have appeared in South America (two specimens) (see Bryan, 1973; 1978). These are either evolved erectus or atavistic anomalies of sapiens.

#### Dentition:

Sinodonty may have evolved early (third Glacial?)

#### Serology:

Blood types of PaleoAmericans are probably remarkably similar (see T. D. Stewart, 1974). This, however, could be due to isolation of a Northeast Asian gene pool during Middle Pleistocene times.

- 1) Model must allow for Calico (80,000 - 125,000 B.P.) and

TABLE 8

PROPOSED MIGRATION SCHEDULE FOR MID-PLEISTOCENE PALEOAMERICANS (E. L. Davis Model)

Proposed Event	Time	Source Information
First migrations 400,000 years before earliest geological estimate (Calico, which is 80,000 to 125,000 years ago).	Second Inter-	Estimates. Extrapolation from Chou-koutien and Siberian informative résumé of evidence/(recent Calico work). See also Bryan (1978).
MIGRATIONS		Extrapolations from Japan and Siberia

TABLE 9

GENERAL OUTLINE OF PROPOSED STONE TOOL DEVELOPMENT IN THE NEW WORLD

## Tools:

generalized instruments 50,000 - 40,000 years	Early New World tools may have been of Lower Paleolithic appearance--e.g., choppers, chopping tools; bipolar, cobble-core-and-blade products (John Pohl, 1979).
30,000 years	They continued Old World Traditions possibly until Mid-Wisconsinan times when specialized tools became more numerous (Müller-Beck, 1966; Serizawa, 1978, 1979; Oda and Keally, 1979).
20,000 years	Stone points of bifacial designs develop and are recorded at Val-sequillo (Irwin-Williams, 1971) and probably China Lake.

Del Mar (48,000 B.P.).

- 2) Model must allow for (recently discovered) presence of people in Japan and Northeastern U.S.S.R. 30,000 - 80,000 years ago.
- 3) Model must accommodate technological diversity found in North American stone technologies before the appearance of Western Lithic (e.g., Lake Mojave) and Fluting Co-traditions after 15,000 years ago.
- 4) A workable chronological model for the CDCA must also be open to the possibility of relatively early physical types being present in the New World. This is suggested in a section of this report, entitled "Evidence for Early Hominids, etc." based on two little known skulls from Lagoa Santa, Brazil. This anomalous population is not to be confused with the familiar (and modern) "Lagoa Santa Man." The possibility requires intense investigation, since verification might push the spread of our species to this continent into a time bracket measurable in hundreds of thousands of years rather than tens of thousands.

TABLE 10  
PREHISTORIC CORRELATIONS:  
SOUTHERN CALIFORNIA DESERT

TIME YEARS B.P.	PERIOD	ARCHEOLOGICAL SIGNATURES	CONDITION OF LAKE	DESERT WOOD WORK TOOLS	LOW TREE LINE
4,000 - 6,000	Pinto Lacustrals	Tri-notched points; milling stands	Ephemeral 40-foot stands	None	None
8,000	Final Paleo- Indian (San Dieguito III)	San Dieguito III stone tools	Unknown	None	None
10,500 - 11,500	Clovis Phases & lacustrals	Fluted knife/point	Intermediate	X	X
?	Early San Dieguito	San Dieguito III?	Ephemeral lakes		
22,000	Yuma (and Truckhaven?) Burials (San Dieguito I?)	San Dieguito I? Levallois (Ridgeback), Bipolar and Poly- hedral Core traditions	11,000; 12,000; 14,000	X	X
80,000 - 125,000	Pinto Wash (Archeolithic)	Large tools and poly- hedral cores (archeolithic)	Ephemeral, deep lakes	X	X

TABLE 11

DESERT ARTIFACT SEQUENCES: THE SAN DIEGUITO--AMARGOSA--YUMAN MODEL

This system is based on the early work of Malcolm Rogers (1966), reviewed and revised first in the Ventana Cave report (Haury, 1950:193; Begole, 1973, 1974; Hayden, 1976).

OLD SEQUENCE	REVISED SEQUENCE	ADDED SEQUENCE
		Yuman III
		Yuman II
Amargosa II	Basket Maker III (Lino Gray Intrusive)	Yuman I
Amargosa I	Amargosa III	
Pinto- Gypsum	Amargosa II Amargosa I	
Playa II	San Dieguito III	
Playa I	San Dieguito II	
Malpais	San Dieguito I	

A REDUNDANT, TECHNOCULTURAL SKETCH FOR CALIFORNIA

DESERT PREHISTORY: THE CDCA MASTER CHRONOLOGY

E. L. Davis

Figure I:3 (a diagram) is a composite sketch constructed with graphics (e.g., the "Climate," "Morfs" and "Bifaces" columns; with micronyms (e.g., "Morfs" and "Teks"); with coined terms such as "macrolith"--a large, simple tool of stone--or "archeolithic"--a descriptor that literally means "old stone" and is applied to pre-bifacial tools, to the periods of which they were characteristic, to tool patterns or "morfs," and to technologies (or "teks" for short) with pre-projectile point correlations. In addition, familiar descriptors such as "tradition," "co-tradition," "San Dieguito," "Fluted" and "Tri-notched" are sprinkled through the graphics. All these methods of presentation overlap in a multisemantic manner providing a large amount of purposive redundancy. Redundancy is required in this graph (graf?) as it was in the color-coded schema of site descriptors used on the Bureau of Land Management "sensitivity" maps (see Methods of Work Section). Redundancy, at this stage of overviewing California Desert archeology, is a realistic recognition of the many points of view and terminologies that are currently in use and with which we must start. We begin with a 4-dimensional, intellectual jungle not a neat, plane table map.

Only by recognizing and graphically portraying this confusion can everyone in the profession become convinced of the need to get to work, now, and bring order out of chaos. The chaos is partly semantic, partly epistemological. By creating Figure I:3, I present to you a picture of intellectual uproar --with which we begin. I suggest that a series of meetings

and a series of critical writings should be sponsored by SCA and local groups of prehistorians in order to rearrange and reconsider the materials of California prehistory: to what morfs and teks are we giving what labels?

As previously mentioned in this report, a "morf" is defined as a basic element of artifact shape (e.g., "fluted," "stemmed," and "3-notched"). A "tek" is defined as a basic concept of stone reduction. How do you make little ones out of big ones? Splitting a cobble with bipolar compression is one example of such a concept. Purposive thinning is another.

A recognition of the classificatory importance of Teks (in addition to Morfs) is essential for archeological reorganization. Another basic classificatory concept is the "toolkit" or "complex" of which any diagnostic tool or index fossil is merely a part. We need also componential analyses of the stone objects that provide basic resources in archeology: what are the frequencies of association of elements?

Sets or Complexes or Toolkits, whatever you choose to call them, are more reliable expressions of techno-cultural stages than are "diagnostic tools" such as knife-points. As examples, first, "Lake Mojave" - "San Dieguito" - "Cordilleran/Haskomat" "points" are all labels applied to an ill-defined collection of long, ovate morfs. Second, a list of the typical contents of a Classic Lake Mojave/Clovis toolkit at the Basalt Ridge Site Area (Davis, ed., 1978c:38-39) is presented. The toolkit contains both stemmed ("Lake Mojave") and also fluted ("Clovis") knife/points. They occur together repeatedly, but if the component subsets of their teks were analyzed, they might appear as statistically different. We do not yet know.

An excellent place to start finding out will be an excavation of the buried, stratified Lake Mojave site at Iny-20 (Davis, 1969, 1970).

The four objects displayed in Figures V:2a, b; V:3 and V:4 show the confusion of our present systemics. Figure V:2a and b are basalt knife/points found in a pot-hunter's back-dirt at the stratified Lake Mojave site INY-20. They are shaped with irregular percussion removals. Both may be blank stages for finished, shoulder implements frequently called Lake Mojave points. This site would be classifiable as: A Lake Mojave facies of the Western Lithic Co-tradition. The Co-tradition (as I see it) includes a southern San Dieguito facies; the central Lake Mojave facies (see Section VIII) and occasional appearance of an increment from further north. This northern facies is the Cordilleran Culture of Butler (1961), the Hasket artifacts from Idaho (also Butler, 1961), and the Haskomat Complex identified in western Nevada by Warren and Ranere (1968).

Figure V:3 is a good illustration of the sort of confusion caused by typologizing. The specimen has San Dieguito bipoints (also called "Lerma"); the two shoulders of Lake Mojave style; and the broad, thin pressure flake removals characteristic of Cordilleran or Haskett. Figure V:4 is a good example both of the morf (a long shuttle) and tek (very broad and thin removals meeting at a central ridge) typical of Haskett and Cordilleran knife/points.

The Western Lithic Co-tradition is expressed differently at each locus and also changes as one passes from north to south. The various components (facies) exchange independent variables in a fluid manner--and they color one another.

VII

BEFORE PROJECTILE POINTS

The Nature of the Early Man Controversy:

A Famous Case

J. B. Nichols

Projectile points make their unprecedented appearance in America around 11,000 B.P. Fluted projectile points are firmly dated in the High Plains at 11,500 B.P. (Bryan, 1979). Stemmed points appear at Smith Creek Cave and Fort Rock caves somewhat before this. Notched points appear in the eastern-central United States around 10,000 B.P. (Bryan, 1979).

Coincidentally, 11,000 B.P. is the new suggested date for the Pleistocene-Holocene boundary in the Southwest (Van Devender and Spaulding, 1979). Van Devender and Spaulding suggest (based on packrat midden and stratigraphic pollen records) that this was a "time of consistent, widespread, contemporaneous vegetational change throughout the Southwest" (Van Devender, 1979:709). They further suggest that present vegetational and climatic regimes were established after 8000 B.P. E. L. Davis has repeatedly suggested the Great Basin as the origin of the fluted point tradition (Davis, 1978; see also Section IX of this manuscript). It appears certain now this tradition did not originate in its area of climax, the High Plains (Bryan, 1979), and the Great Basin is now the most probable candidate.

This very general correlation of the appearance of projectile points and climatic change might lead one to a speculative hypothesis of the necessity of better hunting equipment necessary to cope with an increasing Pleistocene

extinction. However, Van Devender and Spaulding consider climatic change, particularly winter temperature alteration an unlikely cause because "(i) megafaunal extinctions occurred in many different climatic regimes through-out the Western hemisphere, (ii) the magnitude of the difference between the climate of the late Wisconsin and that of today in the Southwest was small compared to the ecological amplitudes of most large herbivores; and (iii) similar climatic events at the end of earlier glacial stages were not marked by similar extinctions" (Van Devender, 1979:709).

Rather than an intolerance for cold, it seems more likely that the loss of food resources was a more significant link in the chain of Pleistocene extinction. However, this must remain, for the moment, speculative. It should simply suggest that there is an equally likely hypothesis for the appearance of projectile points. The loss of woodland resources may have led both to increased hunting and the development of non-wooden projectiles. The suggestion that men used sharpened, wooden shafts for hunting has long been made, but never tested. An inferential argument is now possible, based on the high percentage of woodworking tools, particularly spokeshaves, at such sites as Calico. What we cannot know is when and if blades or flakes or pieces of stone were hafted onto the wood. An argument of this may be possible in the future.

The gradual loss of a viable environment on the California Desert (with only sporadic returns) at a time when, archeologically speaking the action is just beginning, has supposedly consigned California Desert archeologists to the leftovers of the later Desert Culture complex. If anyone has an investment in a pre-projectile point horizon, it is the archeologist of the California Desert. However, this clearly requires two things. First, do we think there is anything

manifested culturally, that is, pre-projectile point? Secondly, it is necessary to have new concepts which can take up past the projectile point barrier.

All current technological analyses of lithic assemblages are based on the bifacial reduction sequence which results--at its most complex--in the projectile point. This has had several results. It has resulted in the 'lumping' of any other technologies manifested at an archeological site into a traditional category: "Other." Most lithic products at a projectile point production site (whether quarry or camp or hunting blind) will be by-products of the most complex sequence (Nichols, 1978). For example, knives are simply bifaces at a third stage of projectile point production with an added edge.

If bipolar production, or edged chunk production is present at an archeological site it is then lumped, ignored, or subsumed under the Taxonomically non-significant term "unifacial."

The fact is, as L. R. Binford has pointed out (personal communication), we need to start all over in lithic technology because our current taxonomy is so limited. The only thing we can compare is projectile points.

A useful taxonomy must classify both exhaustively and significantly. What are the points of difference--and points of comparison between the Calico assemblage and the assemblage from Lake Mojave, for example? One can do very little when almost the entire Calico assemblage can only be classified as "unifacial." Further, is it really useful to classify keeled scrapers as "unifacial?" Does this really tell us anything?

The technological range reflected in desert assemblages is extensive, and comparisons would be not only informative but, potentially, temporally meaningful. However, first we must have a new taxonomy. E. L. Davis has provided (Figure V:1) an excellent first approximation.

We will never know what came before projectile points if we have no mechanism to recognize non-bifacial production. Unfortunately, the current level of lithic expertise among archeologists is deplorable to non-existent.

The other concept which needs redefinition is that of 'good site.' Ten years ago we expected 'good' sites to be sealed, 'living floors' in 'good geologic context.' Today we know there is no such thing as an undisturbed "sealed" context. All human deposition has been disturbed both superficially, and post depositionally. Much disturbance has geologic parameters: cryoturbation, graviturbation, argil-liturbation, aeroturbation, aquaturbation, crystalturbation, seismiturbation (Wood, 1978). The slightest slope angle insures some downward creep over time.

It is now possible to assess even such actively altered contexts as riverbeds (Isaac, 1977). That is, we are no longer in an age of "good contexts," or even "acceptable" contexts. Each context is somewhere along a continuum of disturbance. It is no longer an accept or reject proposition.

The difficulty of assessing an alluvial fan context and the lack of decisive diagnostics of humanly altered lithic materials led to the rejection or dismissal of the Calico site (Jennings, 1974).

Excavation of Calico began in 1964 at a site selected

by Dr. Louis Leakey and Ruth D. Simpson. In all, twenty-two pits and trenches have been dug. Master pits I and II have been partially examined and approximately 5,000 artifacts (stone tools and flakes) have been designated. A more exhaustive analysis of two units in master pit II (H - 13 and I-13) was conducted by Clay A. Singer (Singer, 1977) using a binocular microscope. Singer has examined +/- 4,000 pieces of stone and, based on morphology and wear, has identified approximately 800 tools. These include large choppers and core tools, however, flake and blade tools dominate the assemblages. There are from two to twelve assemblages--in this case, defined as concentrations of artifacts--with peak concentrations of tools at four depths (11', 13', 21', 23' below surface).

No within-assemblage analysis has been made; however, such an analysis may never be useful. The surface pavement at Calico is a continuous pick-up quarry, with small areas of concentrated flakes where a particularly good nodule has been found. Dr. Roy Shlemon believes the relationship to the raw material source was approximately the same during the whole period of the fan's activity, and therefore it may always have been a pick-up quarry (personal communication). That is, looking for "living floors" may be entirely futile. Further, the fan has always been subject to gentle downflow. Any meaningful associations have most probably been lost.

This is not to say that the context of the alluvial fan cannot be assessed (Shlemon, personal communication). The dynamics can be analyzed and a low continuous alluvial fan is suggested. All over surficial damage on artifacts would be expectable in a catastrophic mudflow situation, and Singer's analysis has rejected this. Damage occurs only on edges and in a manner isomorphic with use-wear. The hypothesis that the artifacts could have a natural origin (Haynes, 1973),

while never actually tested even by Haynes, seems farfetched since there is no evidence even of damage.

However, in the last analysis, given the fact that spatial relationships are lost by time and context, the case at Calico turns on the acceptability of the artifacts. The question is not, is this a site or not--for if human workmanship can be demonstrated, it is a site however rearranged. The question of whether one utilized flake is a site or not has to do with operational variables or diagnostics. In theory, one flake--if it can be shown to be humanly struck--constitutes an archeological site. The question is rather, what are the operational variables by which humanly altered stone may be identified? Past designated variables, such as bulbs of percussion and lipping have been shown to occur on as little as 30 percent of a collection ofdebitage from a replicated projectile point (Patterson, 1977a, 1977b; Nichols, 1978). It is a simpler matter to refute diagnostic claims than to reanalyze our basic concepts of lithic technology. Calico has been only one victim of the bifacial reduction sequence complex.

One may treat a pre-projectile point horizon as a hypothesis, but new tests must be designed. Our current tests cannot be expected to 'diagnose' anything but bifacial reduction. Even our new approaches to site context are, for the most part, still descriptive (Wood and Johnson in Schiffer, 1978), and inference from comparison, while adequate for the grander time frames of geologists, is not really useful to archeologists, who deal in microgeology. Desert archeologists, who have the highest stakes in a pre-projectile point horizon, should invest heavily in the research and experimentation which will make possible the observations which will, in turn, lead to much needed new hypotheses about early man.



# VII

GENERAL DISCUSSION OF PREHISTORIC  
ANTIQUITY IN THE DESERT

E. L. Davis and J. B. Nichols

In the remainder of this report, stone arts and Paleo American lifestyles will be discussed as they are visible in the Southern, Central and Northern California Desert. A master chronology (see Section V:1) has been devised to compare archeological evidence from all three sub-areas. This master plan has been illustrated and discussed in Section V.

The plan is based upon the assumptions that people were in the New World for scores of thousands of years (only 40,000 of which show on the CDCA Master Chronology Chart) and that Lower Paleolithic stone technologies survived until recently in the Americas. These simple, aboriginal stone arts have, however, been masked during the past 15,000 years (at least), by tools that are products of very complex manufacturing concepts used in the knife/point and biface technologies (called "Teks" for short). The first of these conceptual advances was intentional thinning of the stone blank. The second definitive change was in shape. Accidental shapes with sharpened working parts were rapidly supplanted by morfs with standardized patterns of silhouette. These standard products are the "point types" that archeologists have learned by heart and are lost without.

Tool-type archeology does not serve us as well as archeology based on environments, technologies, and whole toolkits or complexes--considered as part of social adaptations to environmental change.

An essential ingredient of any archeological investigation is the philosophical position--the epistemology--of the reporter. Therefore, I want to state very strongly that, during the course of this work, I have changed my mind and become a convert to accepting the validity of four (highly controversial) sites. These sites are Texas Street (Carter, 1957); Calico (Schuiling, ed., 1979); the Pinto Wash artifacts reported by Childers and Minshall (in press, 1980), and the Yuha Burial (Payen, Rector, Taylor, Ritter and Ericson, 1978; Bischoff, Childers and Shlemon, 1978; Bischoff and Childers, 1979). Let me enumerate the reasons for these changes of opinion.

1) Texas Street: experimentation with fracturing cobbles, and observation of natural cobble deposits indicate that the action of streams, waves and mudslides tends to make cobbles rounder and rounder rather than cracking them into cores, blades and usable detritus. On a coast of the Soviet Far East, I recently walked along a mile of glacial-outwash consisting of porphyritic and basaltic cobbles. The stones were ovate in shape and remarkably perfect although constantly exposed to wave action. Cracked stone was rare. Therefore, I suggest that a high frequency of broken cobbles probably shows human intervention. The bipolar method of cracking rock is extremely wasteful and produces much useless breakage. One must split many cobbles in order to create the blanks necessary for a useful toolkit. These observations apply to the cobble industry of Buchanan Canyon as well as to Texas Street. The Japanese archeologist Chosuke Serizawa informs me (personal communication, 1979) that smashed cobbles like those of Texas Street are common in the Geological Society Cave, a Soviet site in the Dal'ny Vostok. That is, eastern Asia and southern California have comparable examples of bipolar teks based on local abundances of cobbles. This supports the premise (Section IV)

that Asia and California shared traditions of great antiquity.

2) Calico: Calico fan deposits overlying the Barstow Formation contain typical quarry-workshop distributions of rock--e.g., unmodified junk from natural spalling of platy chalcedony; junk that has been used; and a few excellent artifacts, particularly the polyhedral cores. The lower deposits of artifacts are incorporated in fanglomerates (just above the Barstow Formation) that compare in age with Marine Isotope State V: 80,000 to 125, 000 years (Roy Shlemon, written communication, 1979). What Calico needs is an up-to-date, aggressive program of geomorphological investigations.

3) The Pinto Wash/Yuha Area: The Salton Trough is one of the most archeologically rich, varied and potentially informative areas in the entire California Desert Conservation Area. It has been extensively sampled yet remains a prehistoric anomaly: little known archeologically, differing in deceptive ways from (as examples) the Pinto Basin, the Death Valley Lakes System (China, Searles and Panamint) or the Colorado River sites. It is situated in extreme Southern California, an area that at present has more than its share of archeological tangles and controversies. Within Southern California, the "Early Man" mystery continues to plague conservative and venturesome archeologists alike: at Del Mar (48,000 years of age); at Calico (80,000 - 125,000 years of age?); at Texas Street (120,000 years of age?) and within the Yuha district of the Salton Trough where a burial has been dated at >21,000 years by two different methods. Adjacent to the West Mesa Sampling Area described in the Westec 1979 report there are two hotly contested foci of scholarly dissention. These targets are the Yuha Burial (Bischoff, et al., 1976, 1979; Payen, et al., 1978, 1979);

also the Pinto Wash macrolith tools (Minshall and Childers, 1979), recently exposed more than 20 m below the desert surface. Any extended discussion of either the burial or the macroliths would be inappropriate in this report. On the other hand, failure to mention the astonishing nature of such archeological contents of the Yuha Desert would be a dis-service to the reader, particularly since the burial and associated carbonates have both isotopic and racemization dates in the 21,000 to 23,000 year bracket.

THREE PRINCIPLES IN A GENERAL THEORY OF  
ARCHEOLOGY APPLIED TO THREE SUBSECTIONS  
OF THE CALIFORNIA DESERT

E. L. Davis

Three desert areas are defined by geographic boundaries for comparative discussion in this report. These are defined (below) as the Southern, Central and Northern California Desert. The Southern Desert lies between the Mexican border and the latitude of the Angeles Crest mountains; the Central Desert extends from the Angeles Crest and Twenty-Nine Palms northward to the Garlock fault; and the Northern Desert from Garlock fault to the Nevada line. This latter includes the entire Death Valley System of Pleistocene lake valleys (Blanc and Cleveland, 1961:1-14). The northern sector also contains the lake valleys of Saline and Eureka basins, Little Lake and Owens Lake.

The three subsections and the exemplary site areas they contain are shown on a map, Figure I:1.

I. The Principle of Synergetic  
Landscape Reconstruction

It is our view that archeology is not simply a discipline devoted to artifact hunting and to predicting where people may have lived. We feel that no general theory which is exclusively anthropological in nature can account for geoarcheological phenomena (Davis and Nichols, in preparation). No taxonomy for the California Desert which is either exhaustive or significant can be derived from the limited cultural information. Any general theory of desert archeology must be

concerned not only with processes of site deposition and formation, but also with those processes that preserve and/or expose sites.

Although fundamental to this approach, environmental reconstruction is, still, in the hands of most archeologists, an unsophisticated process. Climate, physiography and biota absolutely condition both site selection by humans and also determine subsequent alteration, disturbance or preservation of the sites (Wood and Johnson, 1978).

Pinto Wash illustrates one major principle of our general theory: synergetic landscape interpretation (see Figures VII:1 and VII:2). [Synergetic landscape interpretation considers major geological/climatic variables such as storm trajectory; mountain volume (storage of water, triggering precipitation); slope angle (stream competence of run-off water) and cross section of catchment basins (water retention)]. People selected Pinto Wash through time as both a subsistence base (because of riparian plants) and an avenue of travel, because winds swept down the canyon, and kept the banks clean from encumbering sand. Stream deposits of cobble material (chalcedony, jasper, petrified wood and basalt) supplied stone for tools. This is apparent in Figure VII:3. Cultural materials deposited on the banks of the wash include pottery, various lithic technologies, and features such as roasting pits, stone rings, and concentrated quarry workshop debris. The degree of physical/chemical alteration of stone tools ranges from no alteration at all to weathering so extreme that the body of the stone is gnarled, with deep pits. Flake scars are virtually obliterated. These artifacts must have been exposed for a long time.

Pinto Wash (Figure VII:3) dissects the slope (see Figure VII:2 and Figure VII:1) of a mountain/desert interface.

CONVECTION STORM  
(rainfall)

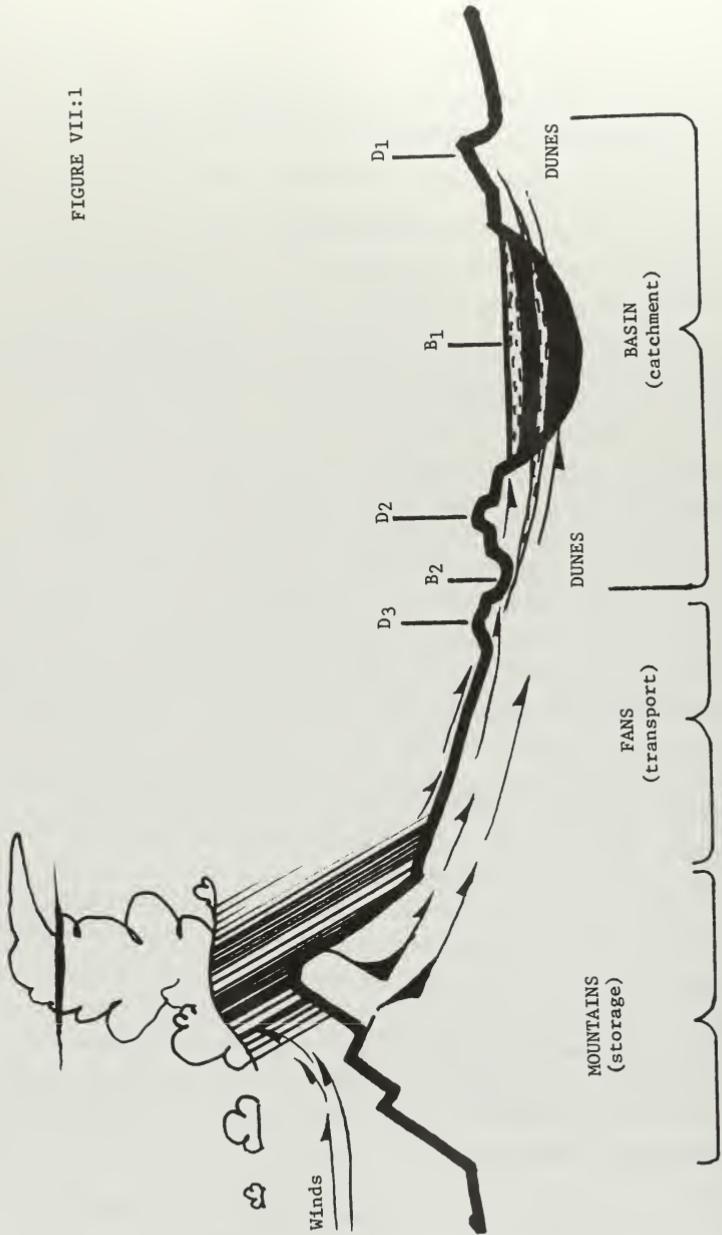
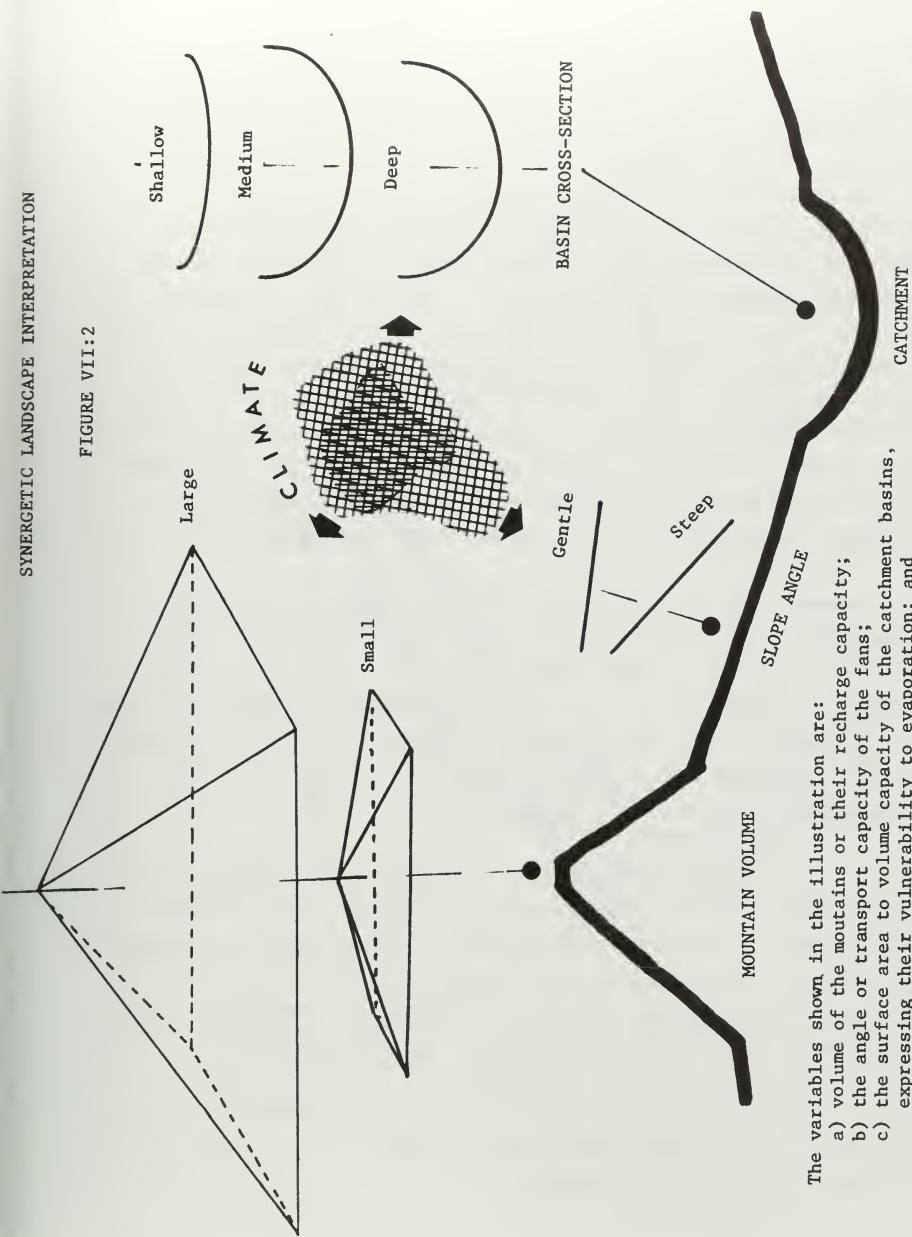


FIGURE VII:1

FIGURE VII:2



The variables shown in the illustration are:

- volume of the mountains or their recharge capacity;
- the angle or transport capacity of the fans;
- the surface area to volume capacity of the catchment basins, expressing their vulnerability to evaporation; and
- the critical determinant of climate.

Climate is cyclical and these cycles, once triggered, can change rapidly.

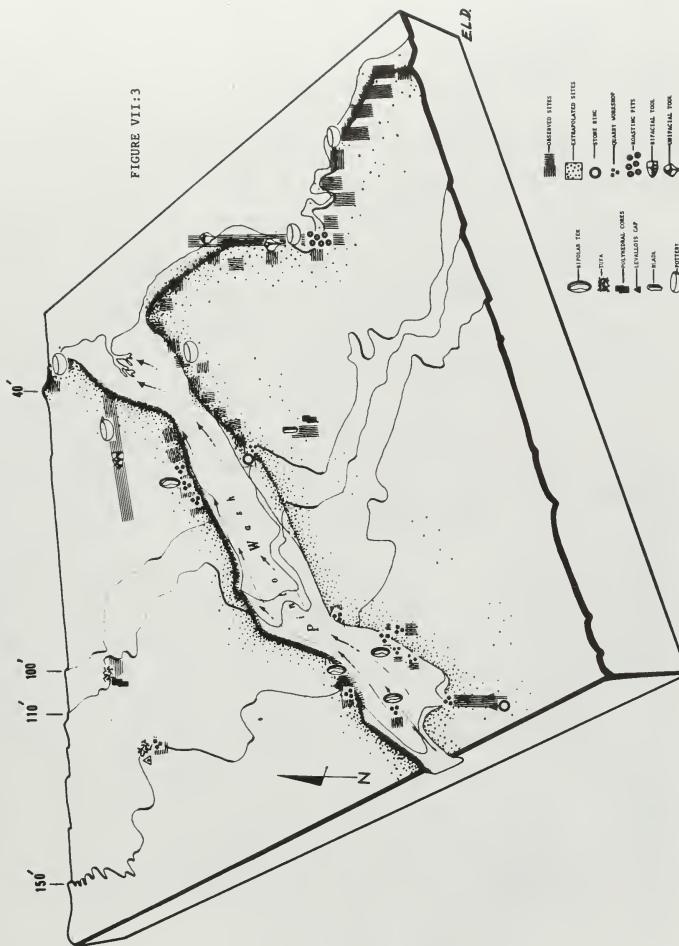
E.L.D.

The rain gathering efficiency of a mountain range is proportional to the water load of the cloud cover and the volume of the mountain massif. These factors condition water availability. However, another important consideration is that the water should be caught, or should pond long enough for plants to germinate. These determinants of environmental habitability existed in Pinto Wash, which was one of the main conduits for water transport down a gentle slope between water storage in the Coastal Range and the shallow catchment of the Salton Trough. (Note: it is essential to remember that the Salton Trough was independently wealthy, deriving water not only from rain, but also from episodic aberrations of the Colorado River.) The wash was a wind tunnel as well. Downslope winds caused sand to be swept clean from the river banks providing a smoothly paved highway for foot travelers.

These same winds have kept the riverside archeology exposed, making sites available to the archeologist. The cultural hypothesis--that these sites are travel phenomena--leads us to suggest that there are few buried campsites. That is, the winds that created desirable site locations also maintained the sites in an exposed condition, particularly on gentle gradients near the lakeshores.

In Pinto Wash, there have been other environmental situations where buried sites could be predicted. For example, along fossil tributaries, or along the relic lake shorelines cut by Pinto Wash (Figure VII:3, at 100', 110' and 150'). However, these require individual interpretation because the values assumed by the physiographic variables (see Figure VII:2) would differ. Obviously the components of Figure VII:2 are quantifiable (Nichols, in preparation) and we believe can be made predictive, though their ultimate significance is yet to be assessed.

Figure VII:3 Block diagram of the Pinto Wash area of West Mesa (Southern Desert) as observed by us. (Westec Services Inc. 1979).



The larger regional environment must always be considered (although we have not specifically so expanded for purposes of this discussion). The Salton Trough regional record (see Tables 12 and 13) can be helpful in initial hypotheses about specific situations (such as the relic shoreline at 150', Figure VII:3).

## II. General Discussion of Geoarcheology of the Southern Subsection

Sites cluster along shorelines, along mountain/desert interfaces and along major drainages (Figure VII:4). The highest site densities are apparent at the mountain/desert interfaces and are well illustrated in the Anza-Borrego Desert area, described in Begole (1973, 1974). Begole and Hayden (1976) have gone further than Malcolm Rogers in describing and illustrating stone tools of the San Dieguito biface series Stages I-III as well as their poorly defined predecessors lumped under the rubric of Malpais.

The Yuha Desert is an adjoining area on the West side of the Salton Trough. It has been extensively investigated by Begole (1973, 1974); von Werlhoff, et al. (1977); Childers (1974, 1977a and 1977b); Bischoff, et al. (1976, 1979); and Payen, et al. (1978, 1979). The archeology visible in this area appears in erosionally exposed lakeshore segments, runs a technological gamut from recent through Clovis (as illustrated in Figure VII:5) and culminates with macrolith tools (cores/blades/polyhedral cores) visible at intervals along strand lines west of Plaster City. They are all lacking on East Mesa (Figure VII:6).

These and other macrolith teks (see Figure VII:7) appear frequently on the Western side of Salton Trough in the Southern Desert. This distribution of macrolith teks is extremely variable throughout the desert region. Non-morfs

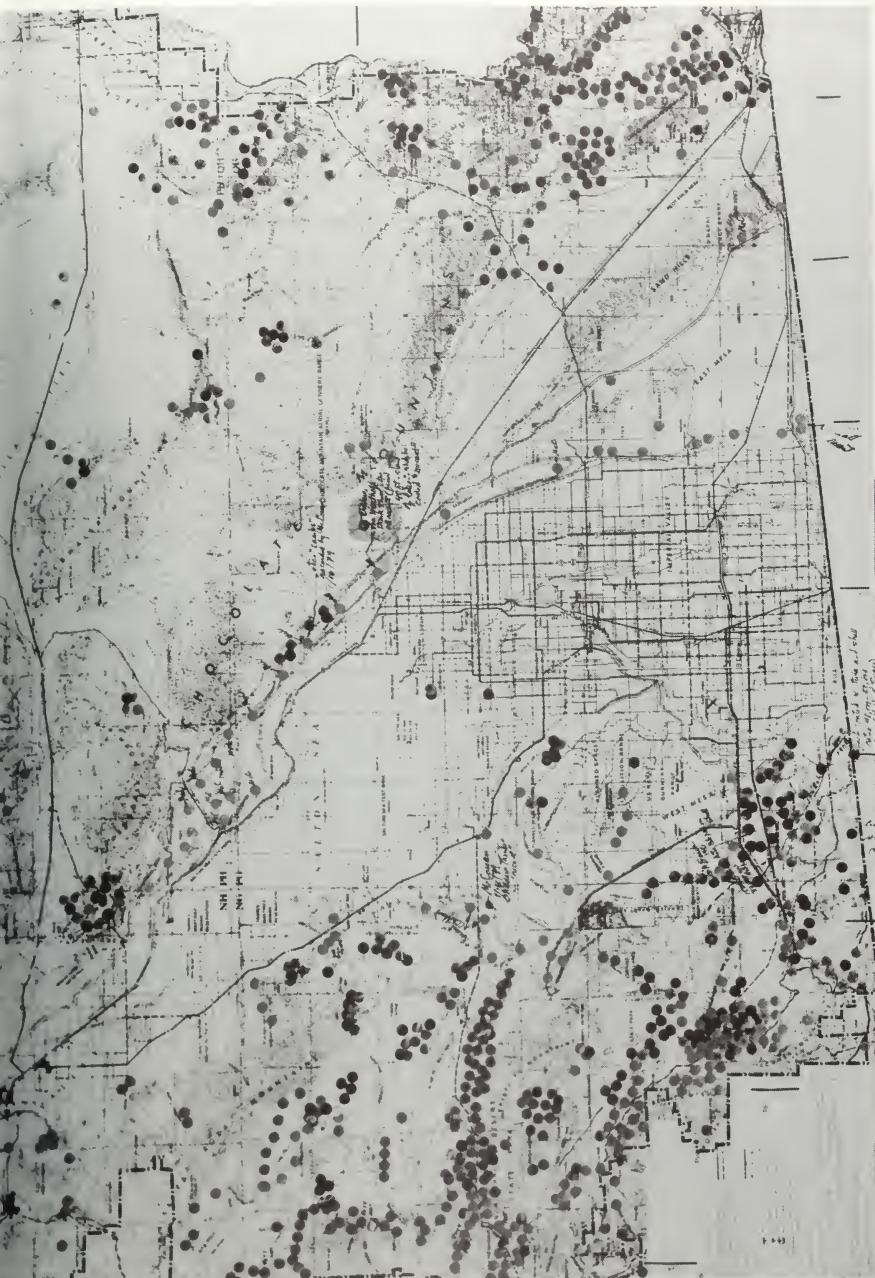
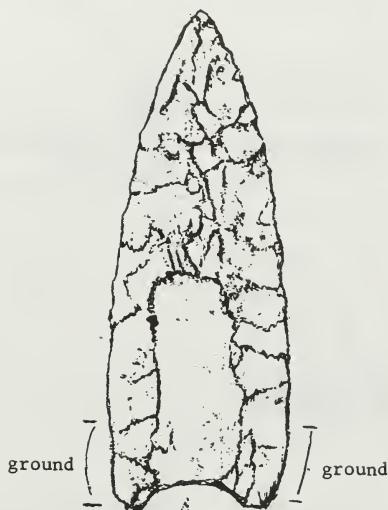


FIGURE VII: 4. Preliminary sensitivity map of the southern Mojave Desert showing the Salton Trough (bottom center) and concentrations of sites along piedmont - desert interfaces to east and west.

and polyhedral cores represent the entire contents of the Central Desert Calico Site but are entirely absent in Pinto Basin and appear infrequently in the Northern Desert. This disparity is the result of both depositional and erosional differences in the three sectors of the CDCA. Cultural distributions are also represented: Haskomat and the fluting component of Lake Mojave/Clovis make a diminishing cline from north to south. Polyhedral cores and macroliths, in contrast, diminish from south to north.

YUHA DESERT  
IMPERIAL COUNTY  
Below old shoreline near  
oyster beds



L-9.3 W-3.5 T-?

FLUTED POINT  
Black chert  
Basal grinding  
Classic Phase

FIGURE VII:5

## SUMMARY OF THE SOUTHERN DESERT PREHISTORY

E. L. Davis

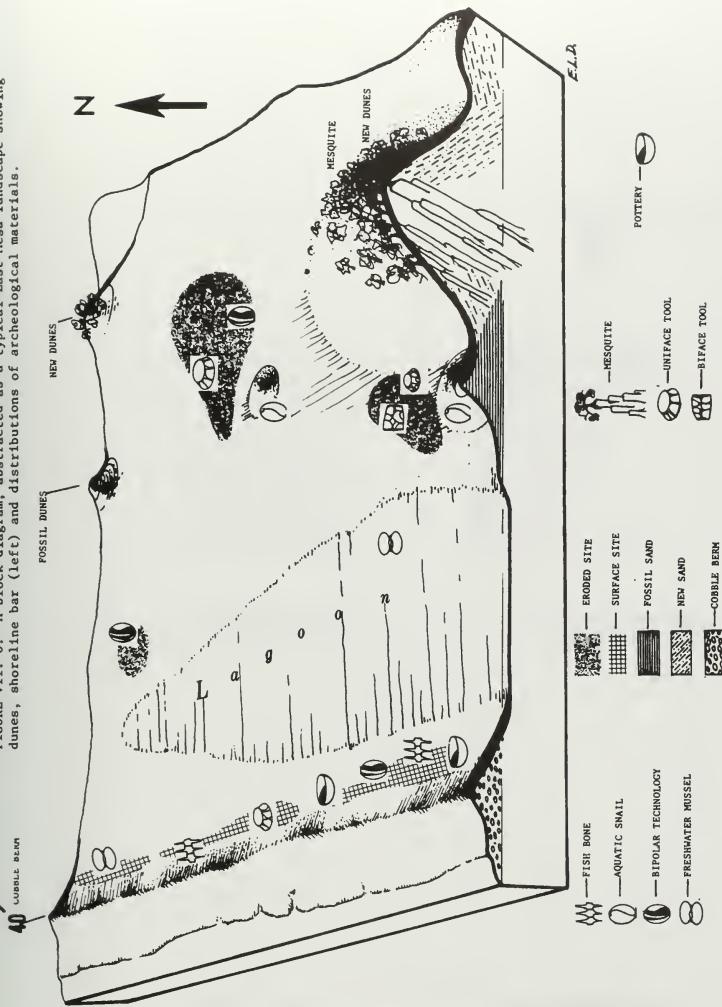
The Southern Desert is archeologically unique:

- 1) Because very ancient surfaces (pavements and berms) and their archeology are kept clean by wind but are still preserved.
- 2) Because the deeply buried archeological counterparts are, occasionally, revealed in banks of great (although short) rivers, like Pinto Wash. Their stream power is supplied by a steep mountain-to-desert gradient.
- 3) Because there was at times a large, quixotic lake in the area. This lake created an attractive shoreline subsistence of marsh vegetation, mollusks, birds and fish.
- 4) Because, during long intervals of climatic severity (Ice Age glacial-pluvials) the southern desert offered a refugium comparable to the Southern California coasts (Johnson, 1977a, 1977b).

Conclusion: although the same ancient, macrolith tools were probably manufactured and deposited further north in the Mojave Desert and Great Basin, they are too deeply buried to be usually encountered. Pleistocene stone tools are, in a word, more conveniently accessible to archeological attention in the Southern Desert and on the coast than in the rest of the Great Basin.

Figure VII:7 is a synoptic view of the temporal and technological positions of archeological populations of the Lake Cahuilla 40-foot shoreline, sites in Borrego Park and the older tools and human remains in the Yuha Desert and

FIGURE VII: 6. A block diagram, abstracted as a typical East Mesa landscape showing dunes, shoreline bar (left) and distributions of archaeological materials.



Pinto Wash. Table 12 presents new radiocarbon dates for high shorelines of Lake Cahuilla. Table 13 presents the recent chronology.



## Lake Cahuilla Phases



## Borrego Phases



## Yuha/ Pinto Wash Phases

FIGURE VII:7

CDCA

## MASTER CHRONOLOGY

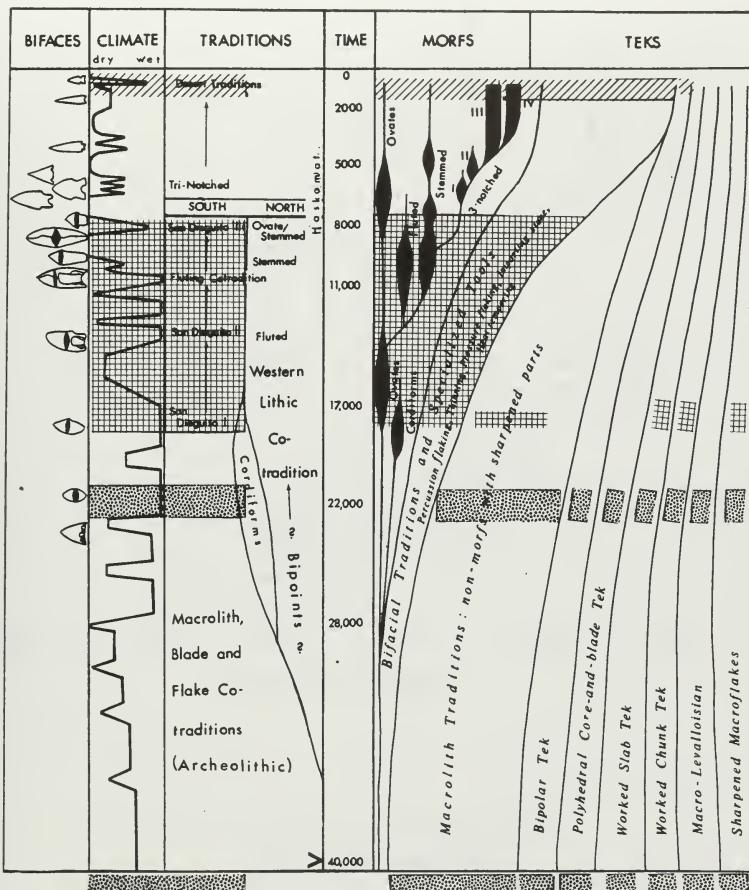
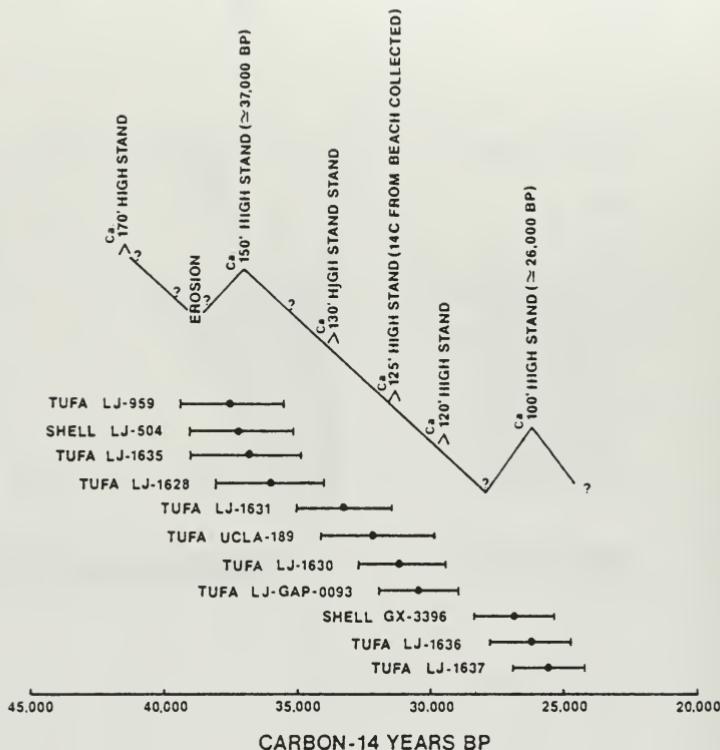


TABLE 12



A CORRELATION OF LAKE CAHUILLA SHORES  
WITH RADIOMETRIC TIME

(After Michael Waters In: Westec Services, 1979 , p. 38).

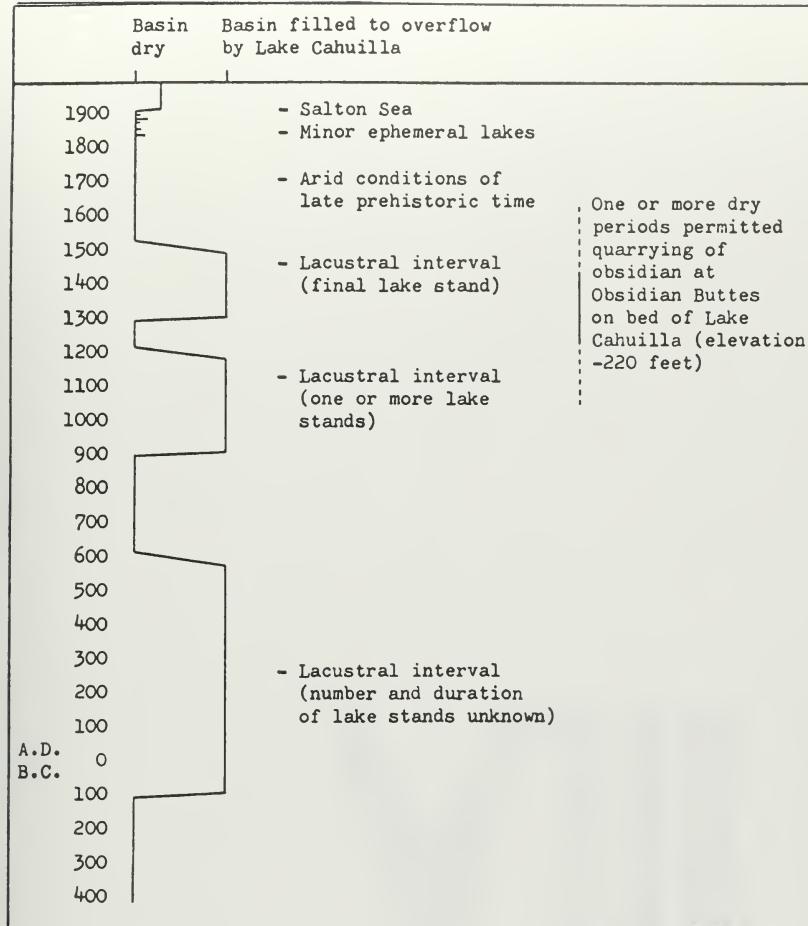


TABLE 13: TIME IS BETTER CONTROLLED IN THE SALTON TROUGH THAN IN ANY OTHER CDCA LAKE BASIN EXCEPT SEARLES (Smith 1968, 1977). THIS DIAGRAM BY WILKE (1978) PRESENTS THE LACUSTRINE HISTORY OF THE TROUGH OVER THE PAST 2,300 YEARS.



VIII

## THE CENTRAL CALIFORNIA DESERT

E. L. Davis and J. B. Nichols

### I. Morfs and Teks in Time: The Principle of Technological Variability

The significance of those technologies which do not belong to the bifacial reduction (or purposive thinning) tradition is still unknown. Either unrecognized or lumped in a category usually called "other," such teks as bipolar, polyhedral core and blade, worked chunks or slabs have never been assessed for cultural implications. They are therefore shown in Figure VIII:1 only as long continuities. It has been observed in Eskimo groups that male lithic technologies may be blade derived, while female technologies (manner of production and assembled products) may be chunk derived (Lewis Binford, personal communication). This is only one of the technological manifestations available for an hypothesis of cultural significance. Other possibilities include a cultural preference linking certain teks to certain raw materials (e.g., round cobbles to bipolar tek), an hypothesis of varying resource exploitation, an hypothesis of temporal variability, etc.

No analysis of this complex variability is possible so long as only flakes and potential bifacial products are recognized. It is impossible to generalize as to which sites will include, and which will exclude technological variability. Obviously, this generalization must come from analysis, again, impossible without the initial taxonomic identification of the technology by its product (see Section IV of this report and Figures IV:1-14).



Pinto Basin



Lake Mojave

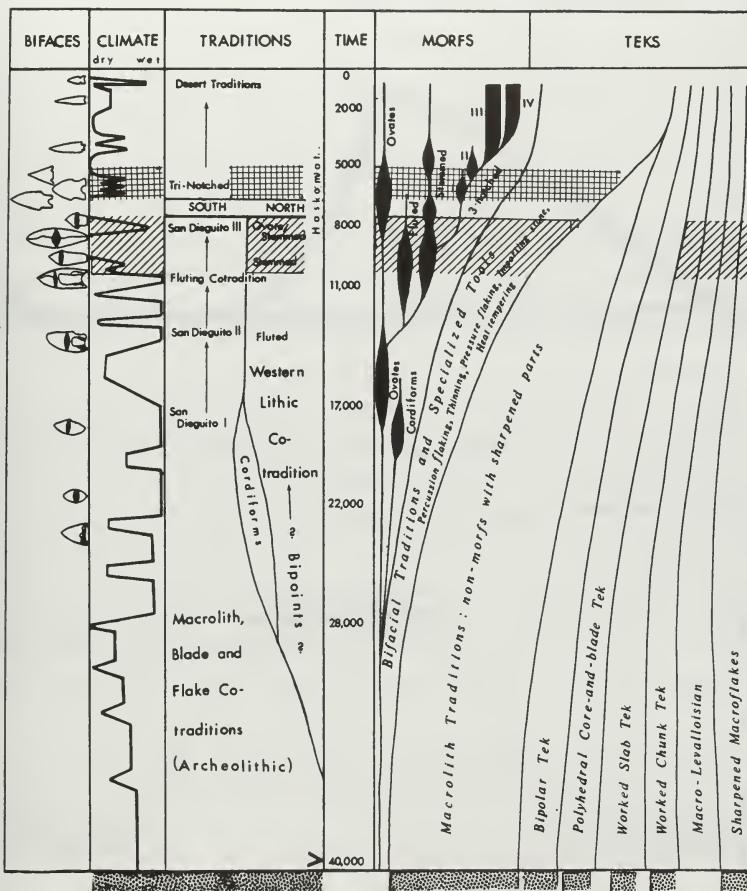


Calico Site

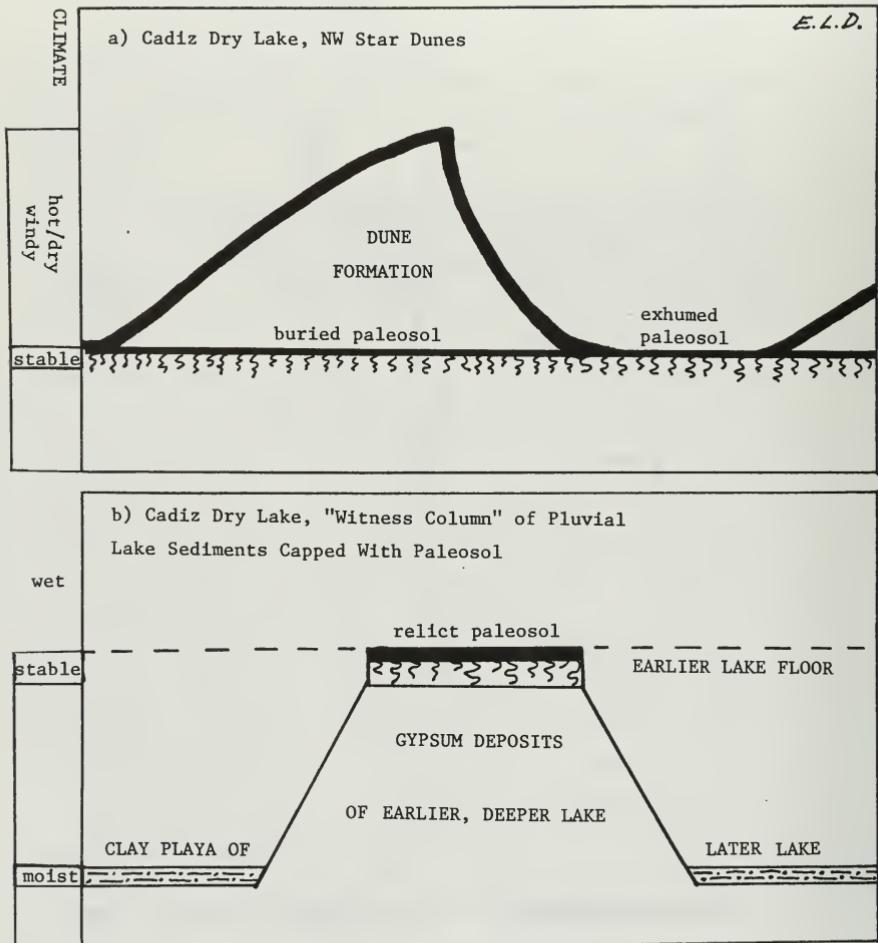
FIGURE VIII: 1

## CDCA

## MASTER CHRONOLOGY



GEOMORPHOLOGICAL RESULTS



SOME OBSERVED RELATIONS OF DUNES, PALEOSOLS AND  
THE PLAYA OF CADIZ DRY LAKE.

FIGURE VIII:2

Figure VIII:1 combines chronological and environmental data with a redundant taxonomy. The suggested taxonomy is illustrated by known cultural taxons (traditions) by bifaces (representing familiar knife/point types known from literature or illustrated in Davis, 1978, Figure 13), by morfs (specialized properties of shape), and by teks (basic taxonomic units of technology). These are illustrated in Campbell and Campbell (1935); Warren and de Costa (1964); Ore and Warren (1971); and Warren and Ranere (1968).

The greater heuristic properties of an expanded taxonomy are apparent when applied to the CDCA. Many objects formerly subsumed under the taxonomically meaningless term "unifacial" (see Nichols, 1980, *in press*) are seen to have technologically significant identities.

As an example of the application of this suggested taxonomy we would like to compare and contrast the assemblages of two sizes of the Central Desert.

The Calico site is an excellent illustration at a Paleolithic level of exploitation of good stone materials in a quarry workshop situation. Although developed bifacial work is not predominant, bipolar, polyhedral cores (Figure VIII:3) and blade teks, worked slab and worked chunk tek and sharpened macro flakes and macrolith traditions are all present.

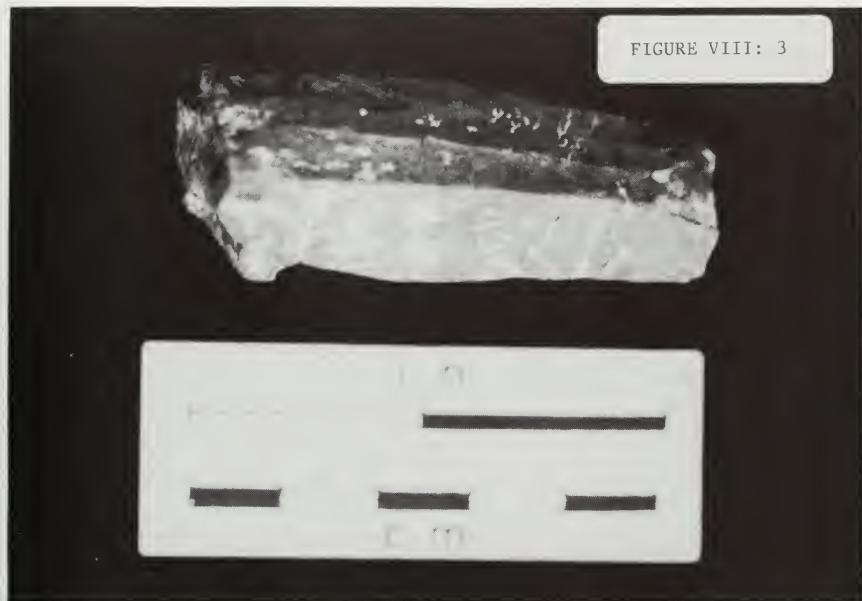
In contrast, Lake Mojave assemblages (a palimpsest of unknown cultural overprints) exclude bipolar tek and polyhedral core and blade tek, and include bifacial traditions, levallois caps, chunk tek (keeled scrapers), slab tek, macro flakes (beaked forms) and other macrolith traditions.

The cultural meaning of this difference between the Calico and Lake Mojave sites has not been explored. Hypotheses

TABLE 14  
PREHISTORIC CORRELATIONS:  
CENTRAL CALIFORNIA DESERT

TIME	PERIOD	LAKE CONDITIONS
4,000	Pinto Basin? Bristol Lake ? Pinto (II)	Low Lake Lacustrals
6,000	Pinto Basin? Cadiz Lake? Pinto (I)	Low, Ephemeral Lakes
8,000 8,500	Pinto Basin?	Lake Dry, Permanent Stream
10,000 10,500	Silver Lake	Fluctuating Lakes
11,500? 13,500	Soda Lake (Lake Mojave/Clovis)	Fluctuating, Deeper Lakes
80,000 200,000	Calico	Unknown

FIGURE VIII: 3



San Bernardino County Museum polyhedral core from Calico K-10 210-216.

of either temporal or environmental import should be tested. However, we reiterate that without a comprehensive taxonomy, comparison under any hypothesis is impossible.

The (postulated) disappearance of bipolar and polyhedral core and blade teks may prove to have great temporal significance. This disappearance may correlate inversely with the appearance of bifacial ("purposive thinning") traditions. The cause of this correlation is, of course, yet to be suggested.

## II. General Discussion of Archeology in the Central Desert

The general applicability of this taxonomy can also be seen in Figure VIII:1 in which the Pinto Basin Site (Campbell, 1935) is placed on the master chronology for the California Deserts, along with Lake Mojave and Calico. A long span of California time is represented. Pinto is roughly mid-Holocene; Lake Mojave is late Pleistocene/early Holocene. Calico equates with Marine Isotopes Stage V (greater than 80 - 125,000 years).

Figure VIII:2 illustrates the severity and extent of climatic changes between 12,000 and 6,000 B.P. in the Central (California) Desert. The examples are taken from observations at Cadiz Dry Lake (Davis, 1979a - Westec Services). Figure VIII:2b shows that the last Pleistocene Lake to occupy the valley was large and deep enough to deposit a series of sediments greater than 2 m in depth, and that, after the retreat of the lake, these sediments lay undisturbed long enough for the surface to weather into a paleosol. Subsequently, as shown in Figure VIII:2a and 2b, a period of high winds ensued which excised much of the sedimentary deposits, replacing them with dune sand. These dunes formed on a later soil produced by weathering of the first eroded surface.



FIGURE VIII: 4

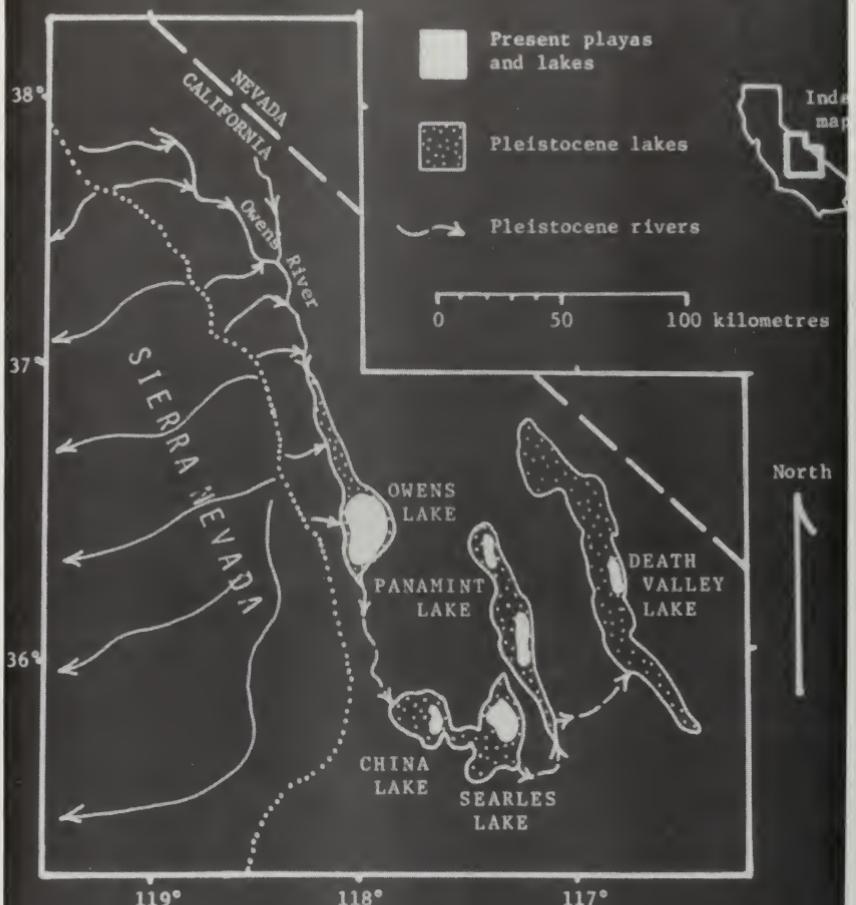
A partial map of the central Mojave desert showing Bristol and Cadiz lakes (center) and the Pinto fault (black arrows, bottom).

These climatological and geological phenomena provide us with a background picture of rapid and intense environmental change needed to understand the equally rapid changes in technocultures reflected in Lake Mojave and Pinto. (Calico belongs in a far earlier and less well-known sequence of climatic episodes.)

A return of moist conditions about 6,000 B.P. correlates with and indeed may explain the cultural manifestations known as Pinto at Lake Cadiz and the Pinto Basin (Campbell and Campbell, 1935; Davis, 1979a in Westec). Lake Cadiz' location is shown in Figure VIII:4. Both dune sand and alluvial downwash have buried late Pleistocene and early Holocene lake shores, thereby concealing any PaleoAmerican or Archeolithic relics associated with them.

**IX**

FIGURE IX: 1



LAKE VALLEYS OF THE DEATH VALLEY SYSTEM

## NORTHERN MOJAVE DESERT

E. L. Davis

### Introduction to the Northern Lakes

In this Northern California Desert Section, Panamint Valley and China Lake information is used massively.

This does not indicate that these areas are more important than others. It DOES show how much could be done with every lake valley if an equal amount of time, effort and skill were applied to it.

Every large lake valley is a textbook of New World pre-history written in geoarcheological inscriptions--the delicate sedimentary record of the lake. Look for the peat layers--the fossil bogs in a geological section. Archaic Indian, PaleoIndian and PaleoAmerican were alike in one habitat preference: they were People of the Marsh. Marshes provided roots, rhizomes, pollen, leaves and stalks, birds, eggs, nestlings, molluscs, frogs and (once in a while) they served as traps for the great Rancholabrean herbivores--the extinct Pleistocene fauna.

Bulldoze a trench, find a fossil marsh--a layer of organic mat--in the profile and you will have your hands on two pieces of prime geoarcheological evidence. One piece is a radiocarbon date on an interval of good subsistence for foraging people. The second bit of information is a prediction that there were sites on the nearest and most convenient ridge of dry ground that also provided a good overview for the camp lookout.

TABLE 15  
PREHISTORIC CORRELATIONS:  
NORTHERN CALIFORNIA DESERT

TIME	PERIOD	LAKE CONDITIONS
4,000	Little Lake Pinto (II)	Low-Lake Lacustrals
6,000	Panamint Pinto (I)	Low Lakes, Springs and Streams Active
8,000 8,500	Haskomat Intrusion	Ephemeral Lakes (brief)
10,000 10,500	Silver Lake	Low to Intermediate Lake Cycles
11,500? 13,500?	Lake Mojave/ Clovis (China Lake)	Two (?) High Lake Episodes
11,500? 40,000	Late Wisconsin Cultures	Lakes Fluctuate, Full to Empty
40,000 200,000	Archeolithic Cultures	As Above

Geoarcheology does not depend on magic numbers and random guesswork.

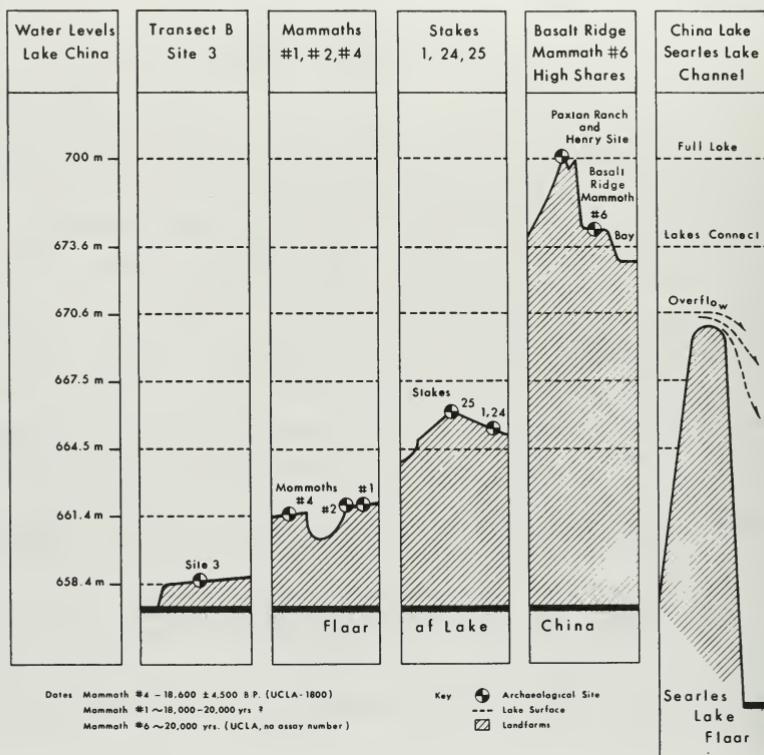
### I. Valley Diversity in the Death Valley Lake System

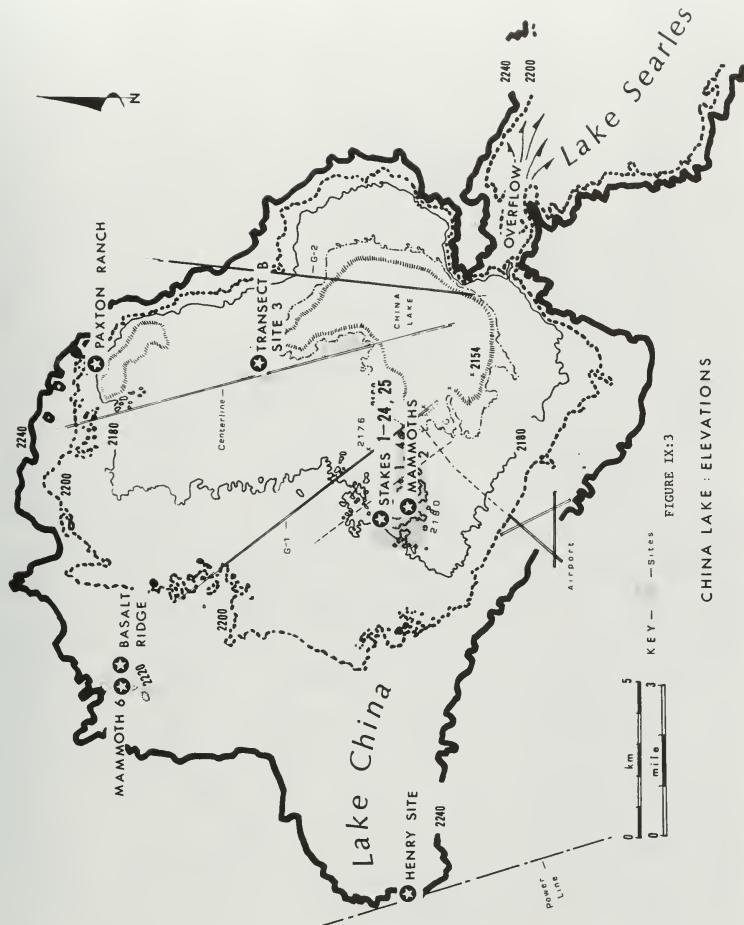
The Death Valley Lake System is both a system of interdependencies in terms of water availability (that is, it is an overflow system of lakes, the lowest being Death Valley) and a set of idiosyncratic environments, constrained by local geology and hydrology (Figure IX:1). The whole pattern of interchange was always downstream; from Owens Lake to China Lake to Searles Lake to Panamint Lake to Death Valley; and was subject to the same major episodes of high water, low water and soil building (Smith, 1968, 1977; appears also as Figure I:3 in this report). However, it is the minor episodes of low level lake stands or small scale pedogenesis which are of the greatest archeological interest. High terraces around pluvial lakes are usually archeologically sterile because they represent glacial/pluvial peaks and environmental sterility. During such intervals, people probably moved southward into the Southern Desert thereby accounting for the high frequency of pre-Clovis artifacts in the West Mesa area. During optimal periods of marshes, people moved back to the Lakes Country, accounting for high frequencies of Lake Mojave/Clovis tools in the Death Valley System.

Since the lakes fluctuated constantly, sites of varying ages are correlated with different lake elevations (see Figure IX:2). As an example, in Figure IX:2 one need only compare the Basalt Ridge mammoth site (column 5) with Transect B, Site 3 (column 2). At a time when Site 3 was situated beside a productive marsh in a shallow lake, Basalt Ridge was located on the edge of a marsh and Site 3 was under 16 meters of water. A plan view of these same sites

## Correlations of Lake Levels, Dates and Sites

FIGURE IX:2





CHINA LAKE : ELEVATIONS  
FIGURE IX:3

and their spatial relation is shown in Figure IX:3.

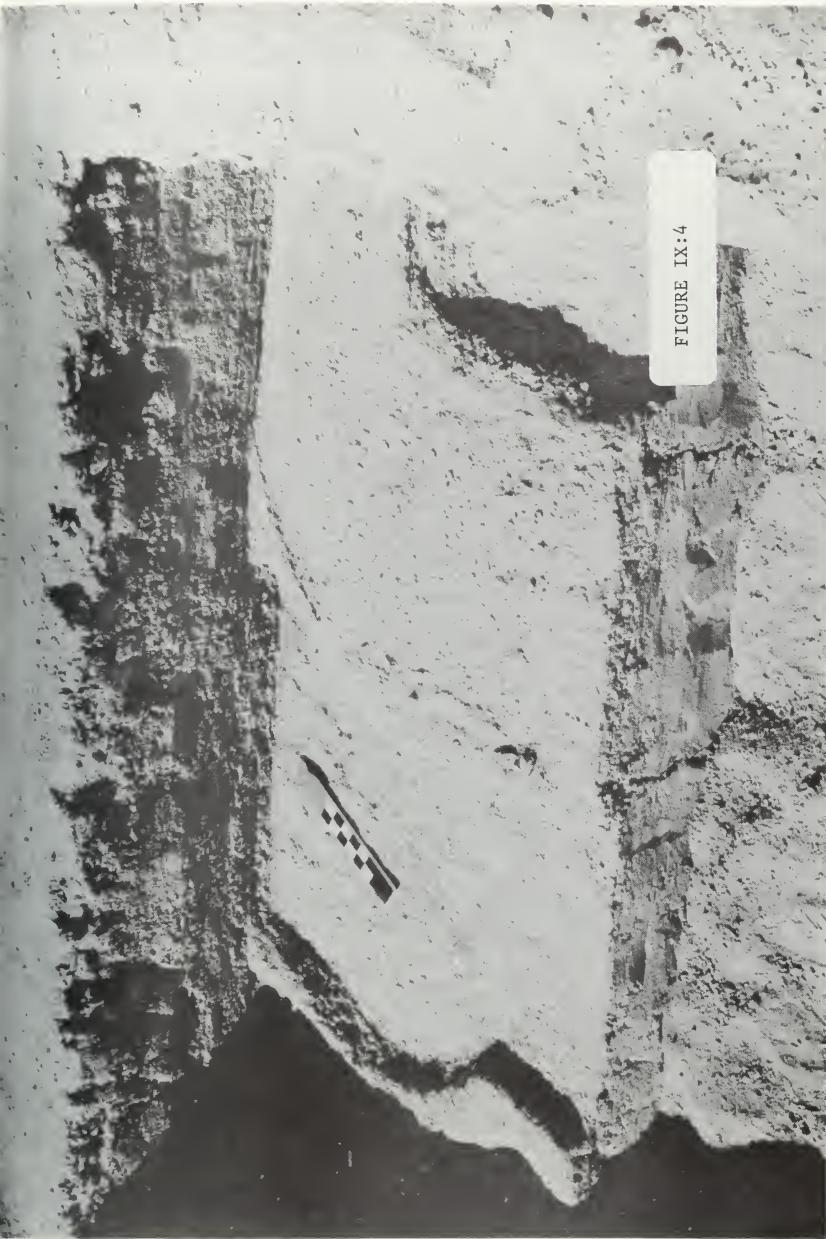
Another example of the archeological significance of a low lake stand coupled with pedogenic activity on the fan is site INY-20 on Lake Hill Island in Panamint Valley. Lake Mojave/Clovis cultural material has been found on a buried paleosol (Figure IX:4).

Archeologists still do not seem to realize there are buried soils in the basins of fluctuating lakes. Also, not all the members of the stratigraphic sections of a lake bed are lacustrine; some are the pedogenic markers of semi-arid intervals, that is, soils. These soils represent intervals of stability when a dry surface was neither being eroded nor covered by deposition. The calcio (caliche) layers that represent their lower B horizons were the bottom of the wetting level at that time.

Figures IX:4-6 are examples of the delicate interbedding produced by slightly different stands of the lakes. Figure IX:5 shows three dry intervals expressed by deposits of aeolian sand overlying a paleosol which is the upper member of wet/dry episodes. Between these episodes a shallow lake was advancing and receding over stake 25. Figure IX:6 shows a dark (red) argillaceous layer at the top of the picture. This layer is the B horizon of a formative, modern soil layer. When the lake rises again this soil will be covered with lacustrine deposits. Lacustrine deposits are also shown at the bottom of the picture where three dark bands (black arrows) point to thin beds of peat, marking layers of swamp vegetation along the margin of a former shallow lake. These shallow lakes undoubtedly coincide with habitation episodes at sites INY-19 and INY-20 (Davis, 1970), the north and south ends of Lake Hill Island. While major advances and retreats of lake levels may be generally correlated

The arrow lies on an ancient (10,000 - 10,500 year) soil surface supporting Lake Mojave/Clovis artifacts.

FIGURE IX:4



Three sand layers describe a long interval of dry winds. The sands overlie the wet/dry deposits of a period when a shallow lake advanced and receded from Stake 25 at China Lake.

Eolian sand 1

Eolian sand 2

Eolian sand 3

Weak paleosol  
(2,500 BP?)

Lake Mojave/  
Clovis tools ▲

ST 25  
14C-4

Rancho La  
Brea bone ●

upper paleosol  
(intact)

Lacustrine gravel  
● ▲

Lower paleosol  
(fractured)

E

Unknown paleosol  
(fractured)

Compaction cracks

FIGURE IX:5

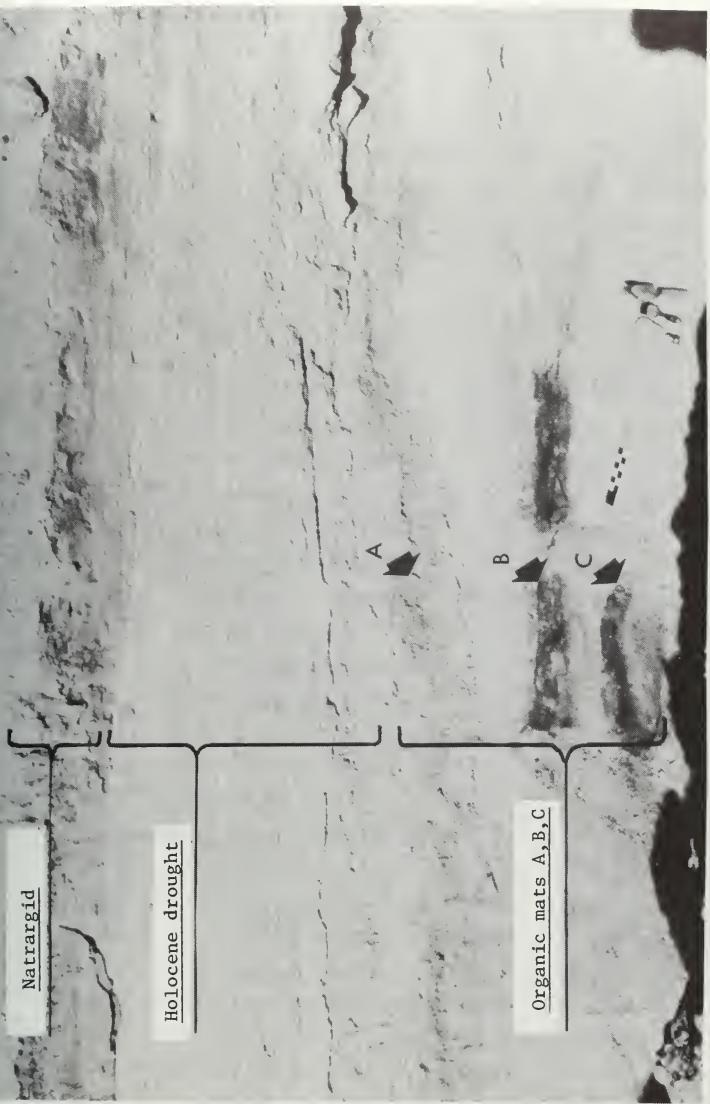


Figure IX:6 Wall of stratigraphic trench at site INY-19, Lake Hill, Panamint. Three organic mats (bottom) represent three terminal Pleistocene marshes.

from lake to lake and may be indicative of major climatic trends, they are idiosyncratically expressed within each lake itself. The situation is further complicated by local factors (particularly faulting), which are peculiar to each valley. Little Lake is an example of this (Meh-ringer and Sheppard, 1978). Using pollen cores, they found that Little Lake generally reflected known climatic trends but more importantly expressed local faulting and highly idiosyncratic hydrology (e.g., the spring water which supplies the lake is 5,000 years old as it bubbles out).

At Panamint, local factors include faulting, the geometry of a catchment basin which is particularly deep and narrow, and the extreme limitations of the watershed. Also, this lake has few springs and no entrant streams, therefore we expect that it has not stood at full level since the Tahoe glaciation, about 70,000 years ago. Because of these hydrological limitations we can contrast Lake Panamint with Lake China at around 12,000 B.P. Lake China at this time was a brimming inland sea that left tufa deposits, while the northern basin of Lake Panamint held only a shallow lake not more than 5 or 6 meters in depth. This is because local factors at Lake China are in total contrast to Lake Panamint. The geometry of the valley differs in that it is broad and shallow. Physiography of the valley floor has numerous highs and lows produced by volcanism and faulting (which meant that during low stands of the lake many inviting camping situations were available to Paleo Americans who were looking for a dry ridge on which to camp beside a productive marsh with an overview of surrounding grasslands (Figure IX:7; also, Judge and Dawson, 1972). This is illustrated by the relationships at Stake 25 (Davis, 1978c) shown in the diagram, Figure IX:7. Figure IX:8, an aerial photograph, shows topography and water supply at the same site area, viewed in a larger context of three to four square kilometers. Surface

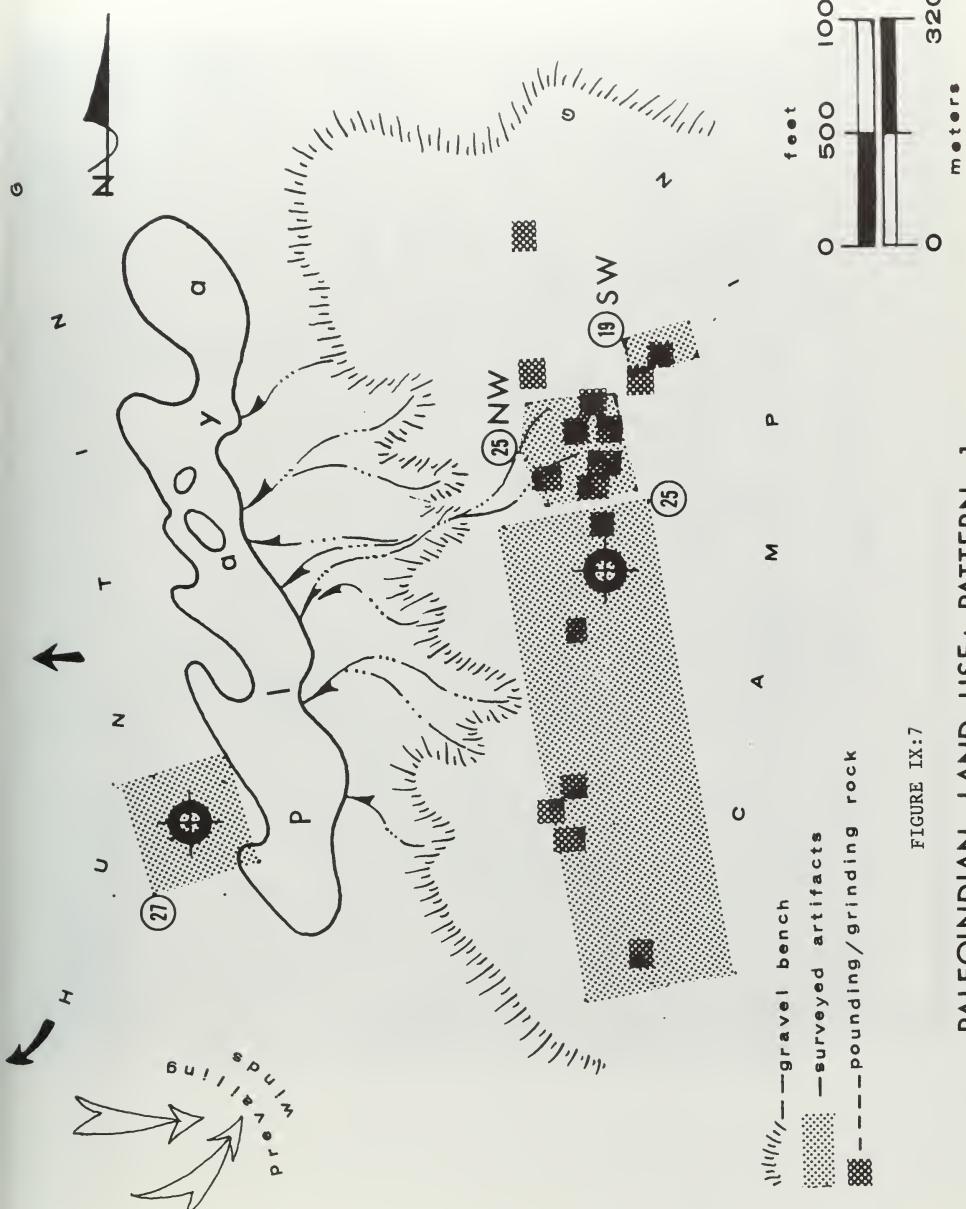


FIGURE IX:7

## PALEOINDIAN LAND USE: PATTERN 1

Figure IX:8 Hydrology and physiography of Stake 25, China Lake.



FIGURE IX:9

FIGURE IX: 9. Aerial view of recent (1978) flooding of China Lake valley, giving some idea of what more permanent conditions were like during the Pleistocene.



dry washes and a high water table fed from the Sierra Nevada maintain ground water in this area only a few meters below the surface of the playa basin even during summer months of the present dry period. Smith (1977) estimates that water supply during pluvial peaks could have been 6-7 times that of today. During such an interval the lake would have been full; sites such as those in columns 1-4, Figure IX:2 would have been drowned.

However, it is not these full stands which are of archeological interest. On the contrary, partial fillings of the valley with low, fresh water lakes constantly replenished by abundant water budgets were the environmental supports of PaleoAmerican communities. The non-significance of such terms as "pluvial lakes culture," and "playa culture" (Bedwell, 1973; Hester, 1973; Rogers, 1938, 1939) should be apparent.

The contrast of the Lake Panamint and Lake China micro-environments is correlated with contrasted cultural manifestations. The adaptive emphasis at Lake Panamint was largely on the availability of the glassy basalt on the fault scarp. An exploitation of marsh subsistences was secondary. At Lake China marsh exploitation was primary. The undulating physiography of the valley evidently created miles of promontory and island shores (Figure IX:9).

Panamint quarries occur along a mile and 1/2 of fault scarp, covered with boulders of fine basalt (Weide, 1969). Quarry debris is spatially continuous (Figure IX:10a). These quarries were exploited episodically during Wisconsinan glacial-pluvials; also throughout early and middle Holocene intervals, by different peoples. Star Dunes at the north end of Panamint Valley, which contained an episodic spring, were the focus of this Holocene occupation (Davis, 1970). The

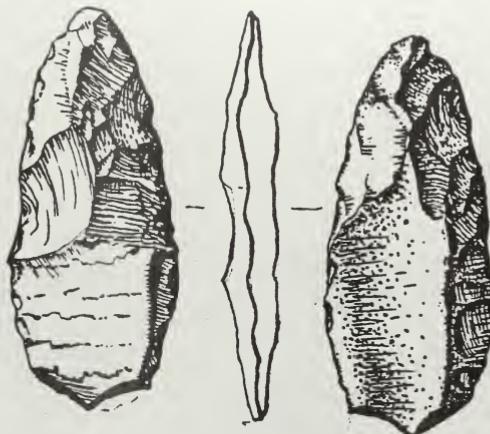


A sequence of product stages from quarry workshop (left) to campsite (right).

Panamint Valley, North Basin Iny-20

L-7.3 W-3.1 T-0.8

FIGURE IX: 10b

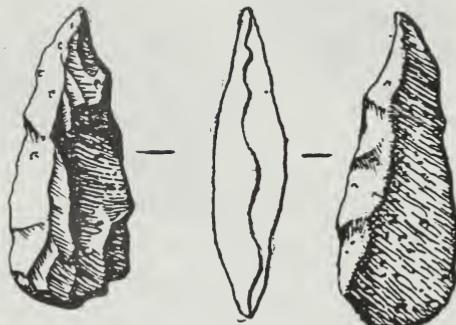


(Pot hunter excavation)

Type I basalt (Weide '69, Fig. 36a)

## Western Lithic Co-Tradition

FIGURE IX: 10c



Panamint Valley, North Basin Iny-20

(pot hunter excavation) L-5.6 W-2.3 T-0.9

Type II Basalt (Weide '69, Fig. 36b)

center of quarry camping during PaleoIndian times, was Lake Hill Island. The dates 10,000 - 10,500 B.P. (UCLA) reflect suitable intervals of time and environmental situations that are visible as three layers of peat from marshy shorelines in trench six INY-19 at the south end of Lake Hill Island. Campsites at this time on Lake Hill Island offered temporary and marginal subsistence to people exploiting sources of good quality basalt on the fault scarp above.

Cultural manifestations at Lake Panamint include complete reduction sequences, with first stages at the quarry on the fault scarp and the final stages and final products at the campsites (Figures IX:10a and V:2a and 2b). Woodworking morfs dominate the workshop assemblage of recognizable fragments. These include 24 choppers (Figures IX:11-34), 5 borers (Figures IX:35-39), microblade core (Figure IX:40), 5 spokeshaves (Figures IX:41-45), 8 picks or adzes (Figures IX:46-53), 4 cleavers or wedges (Figures IX:54-57), and an unusual macro-saw (Figure IX:58). These woodworking morfs suggest the presence of trees and large shrubs that would correlate with the peat bogs mentioned above. This is supported by massive documentation of Late Pleistocene forests in the Southwest (Van Devender, 1979). In Southern California and Arizona, forests had retreated for a last time by 11,000 B.P. Our somewhat earlier dates (10,500 - 10,000 B.P.) are reasonable in light of the fact that the Panamint area is 1500 feet higher than the southern deserts and 250 miles farther north.

There is good circumstantial evidence for correlations between the Panamint PaleoIndian cultural axis of camps and workshops and a series of immense (greater than 100 m) symbolic effigies delineated by aligning rocks on the ground. These represent elaborate shamanistic activities probably conducted for magical control of the dwindling water supply,

reflected in the diminishing peat deposits described above. These effigies are associated with cairns, cleared circles, an occasional flake of workshop basalt and one petroglyph at the end of an alignment.

It should be noted that although most quarry debris is probably post-13,000 years B.P. in age, a few specimens appear to be far older, based on both technology, degree of weathering and tufa incrustations.

Drawings of Artifacts from  
the Basalt Quarries

The following drawings of artifacts from the Panamint Basalt Industry Workshops are all traced, full size, unless otherwise indicated. Measurements, when noted, are in centimeters.

These are reproductions of a collection of field drawings on edge-punched cards. They constitute a quantitative/qualitative study of non-morf tools that are typical of a quarry workshop. Although rough, the drawings contain a number of kinds of observations such as dimensions, task-competence (with implications of kinds of work being performed), and relative age. Age is expressed by small pitting of the stone due to chemical interaction of some of its constituents and by the appearance of very large cavities produced by a combination of chemical and mechanical factors.

A few of the pieces may be scores of thousands of years old. The extremely weathered tools are few in number. They also appear to be more basic, simple and homogeneous than the Lake Mojave Phase toolkit (patinated but not eroded) that provides the bulk of the Panamint Basket Industry specimens. The industry produced: a) complete workshop tools like those

shown in the following drawings, and b) stages of biface tools like those shown in the photograph, Figure IX:10. Finished knife/points in the same figure are characteristic of a camp as opposed to a quarry-workshop.

Figure IX:59 shows heavily weathered macrolithic tools. It is of particular interest that all these tools come from high elevations (between 1,800 - 2,200 ft. MSL). Figure IX:62a is a chopping-tool and spokeshave; Figure IX:59c is a split cobble chopper; Figure IX:59d is a chunk tool. All are suitable for rough-shaping wood as shown in our wood-working experiments ten years ago (Crabtree and Davis, 1968).

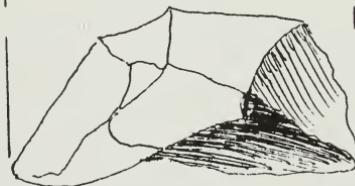
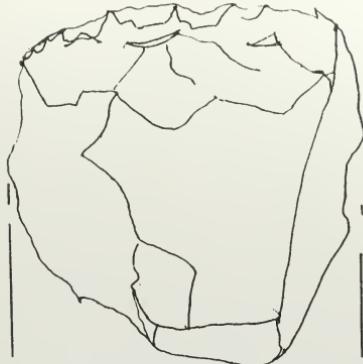
Cultural manifestations at Lake China in contrast to those at Lake Panamint are more diverse in style, in materials, and in space. Raw materials in the China Lake collections are all imported from some distance, from one - two days travel. They consist of obsidians and rhyolites from the Coso area and silicates of highest quality from El Paso Mountain and Rademaker Hills to the South. Important information about trajectories of local travel can be inferred from analyses of materials on different sites. Assuming constant travel as a lifestyle of the people, it can be proposed that if the contents of a site are predominantly silicate rocks, the travelers at the site had just come in from the south whereas obsidian was brought into the valley by bands who traveled in from the north.

In contrast to Lake Panamint archeology which is predominantly a Lake Mojave tek with a trace of fluting, Lake China shows an almost universal mixing of Western Lithic co-tradition and fluting co-tradition morf and teks (Figure IX:60). At Lake China there are numerically more artifacts, more tool types and representation of more cultural phases. Lake China also shows an unquantified sample of



CHOPPERS

Figures 11-34



Panamint #364-134 Chopper

L	W	T	Wt
7	7	2.5	5 oz

A particularly important piece - shows extreme stability of Panamint Is. I site: exposed part sandblasted Buried part - perfectly fresh scars. This artifact was on the top of the south end of Lake Hill Is., 25 feet above the present playa. Note: has a twin #364-135 from PF-K, summit

FIGURE IX: 11

## Panamint Quarry

Panamint #364-159 Chopper and hand axe?

L	W	T	Wt
---	---	---	----

14.5	8.5	3	15 oz.
------	-----	---	--------

1850 ft. Note: very interesting. This looks like water-wear. Scale: 1/2 size

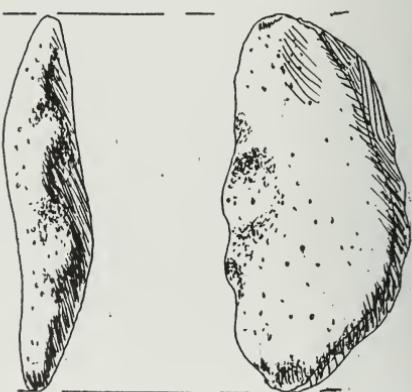
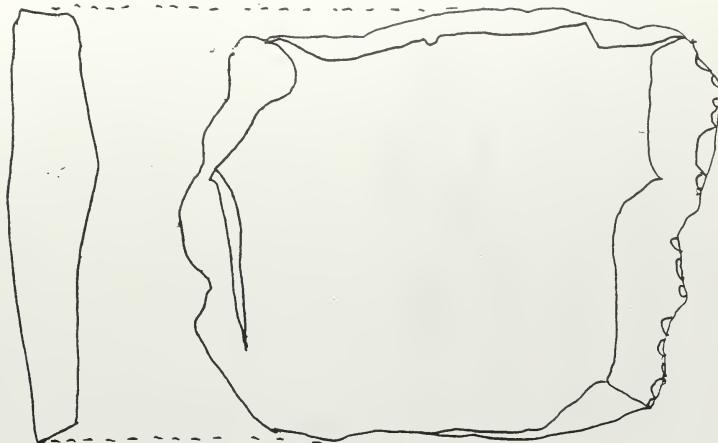


FIGURE IX: 12



L	W	T	Wt
9.8	8.2	2.0	9 oz

FIGURE IX: 13

## Panamint Quarry

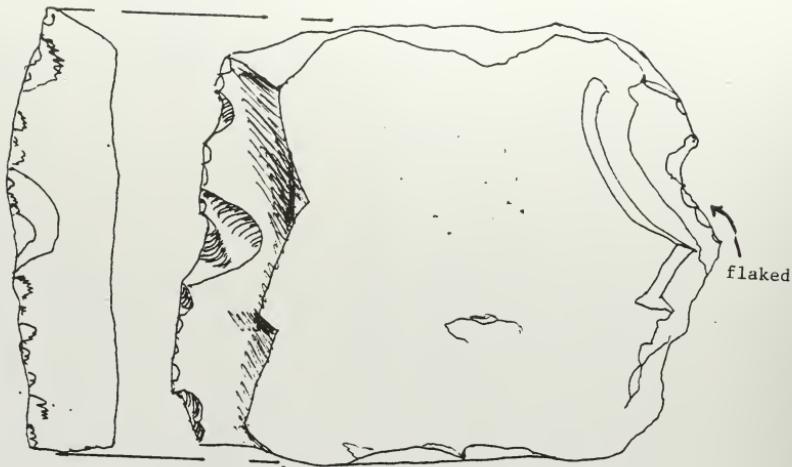
Panamint #364-135

FIGURE IX: 14



L	W	T	Wt
7	7	3.4	7 1/4 oz

Scraper: has a twin - 364-134, from  
bench on Pan. Is. Chopper

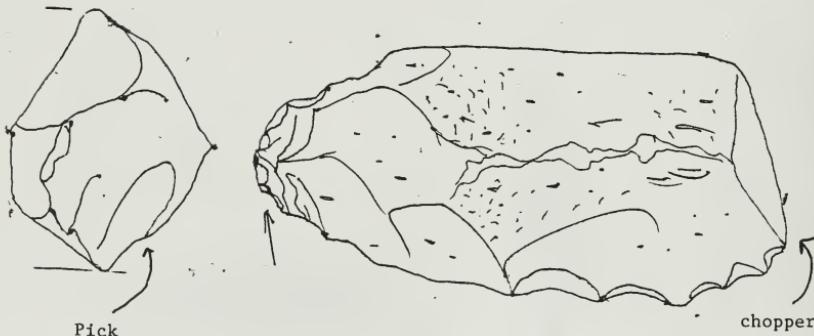


Chopper

L	W	T	Wt
9.9	8.3	1.9	9 1/4 oz

FIGURE IX: 15

## Panamint Quarry

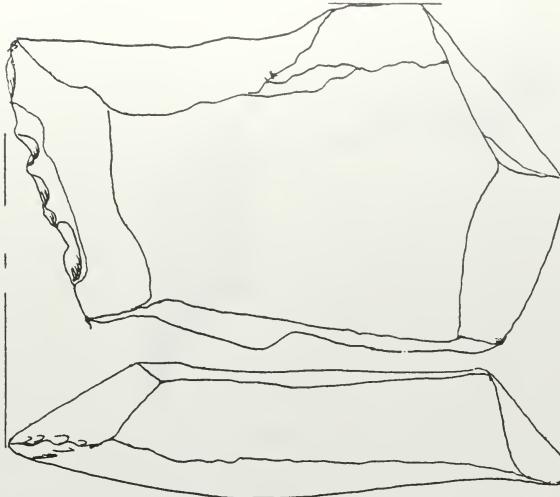


Pick

L	W	T	Wt
20	9.8	7	3 lbs. 5 oz

Scale: 1/2 size

FIGURE IX: 16



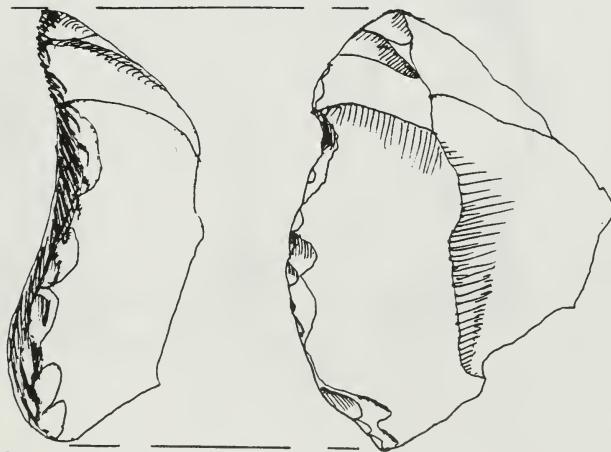
Panamint # 364-125 Chopper 2,400 ft. PT center  
 L W T Wt  
 10.5 6.4 2.3 8 3/4 oz

FIGURE IX: 17

## Panamint

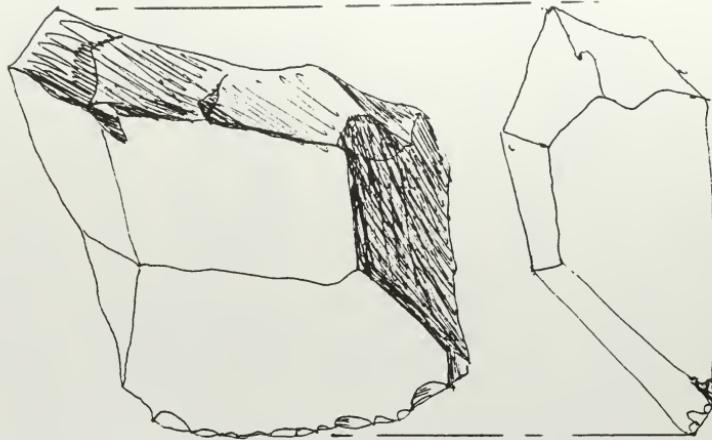
## Quarry

Panamint # 364-119 Small chopper



I W T Wt  
 8.3 6 2.8 4 1/4 oz  
 Scale: full size

Note: flake scars are weathered but less so than general surface

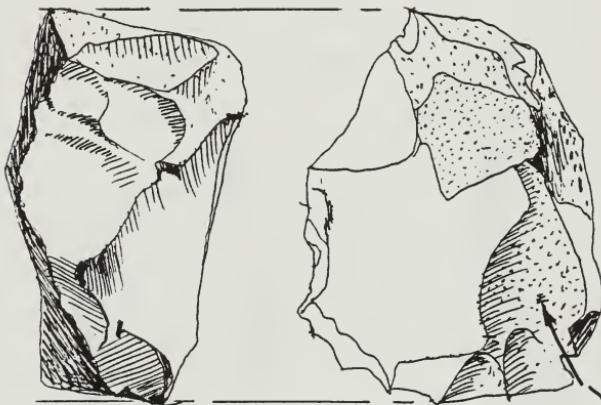


L	W	T	Wt
7	7	3.7	13 oz

FIGURE IX: 19

## Panamint Quarry

Panamint #364-121 Small Chopper

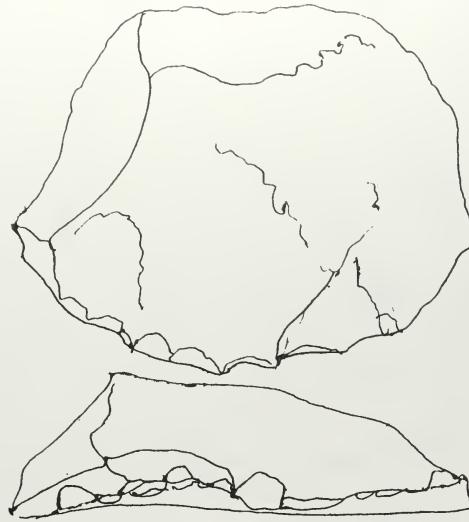


Patinated basalt

L	W	T	Wt
7.8	5.9	4.5	8 oz

This specimen has new-black flake scars. Very fresh  
Scale: full size

FIGURE IX: 20



Panamint #364-187 Chopper discoidal

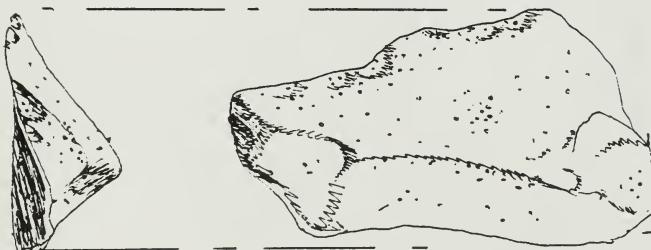
L	W	T	Wt
8.9	6.7	2.6	8 oz

FIGURE IX: 21

## Panamint

## Quarry

Panamint 3364-12 Chopper

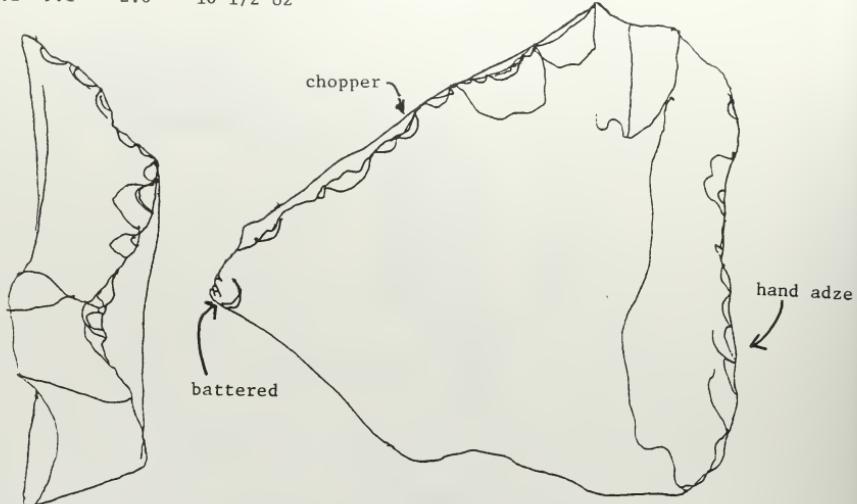


L	W	T	Wt
16	9.4	5	1 lb. 7 1/2 oz

Scale: 1/2 size

FIGURE IX: 22

L W T Wt  
10.2 9.1 2.6 10 1/2 oz Panamint #364-49

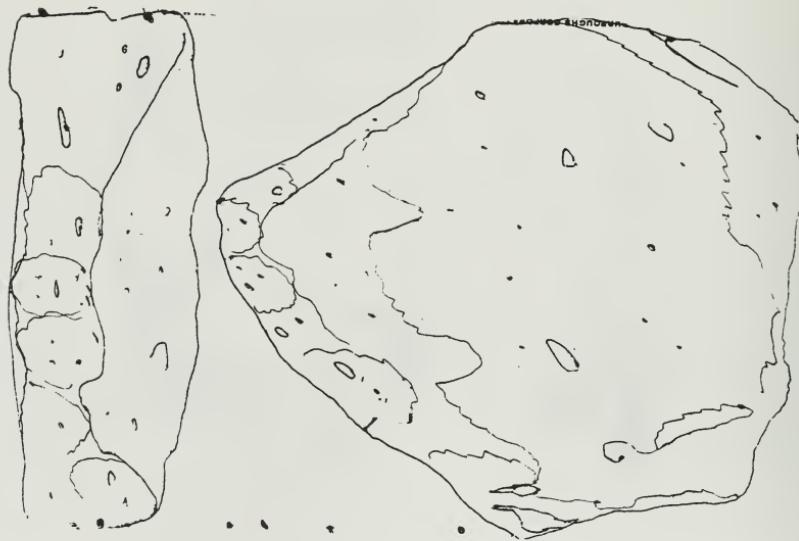


## Panamint

FIGURE IX: 23

## Quarry

Panamint #364-171



Chopper

L W T Wt  
11.3 10 4.6 1 lb 7 1/4 oz

FIGURE IX: 24



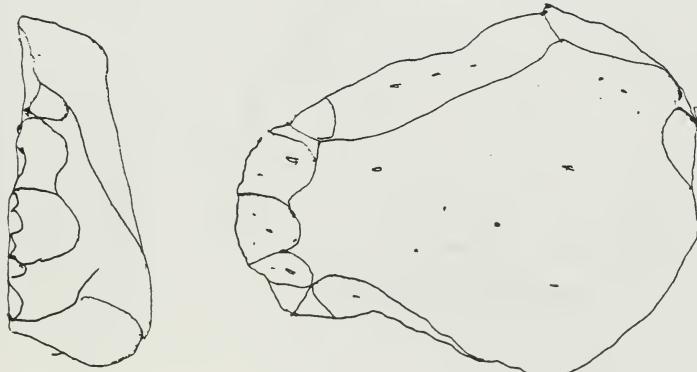
Panamint #364-38 Chopper

L	W	T	Wt
11	9.7	3.5	1 lb. 1 3/4 oz

FIGURE IX: 25

## Panamint Quarry

Panamint #364-195 Chopper in wash



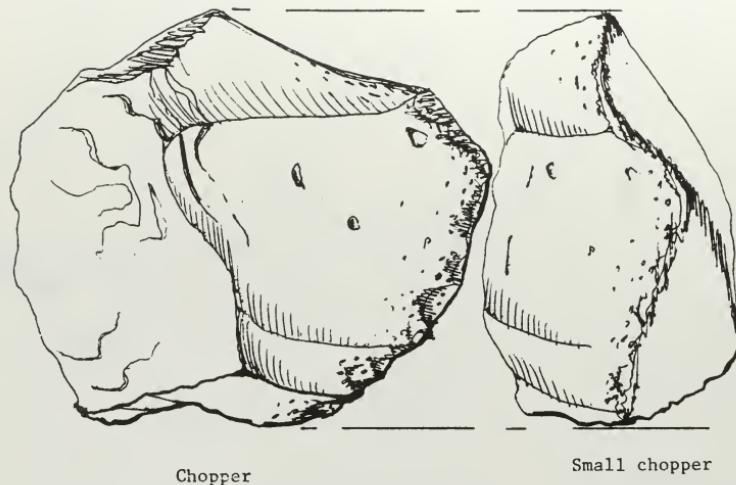
INY-21

L	W	T	Wt
9	7	3.3	7 3/4 oz

FIGURE IX: 26

Panamint #364-122  
P-T - 2,700 ft.

L	W	T	Wt
9.1	8	5	15 1/4 oz



Chopper

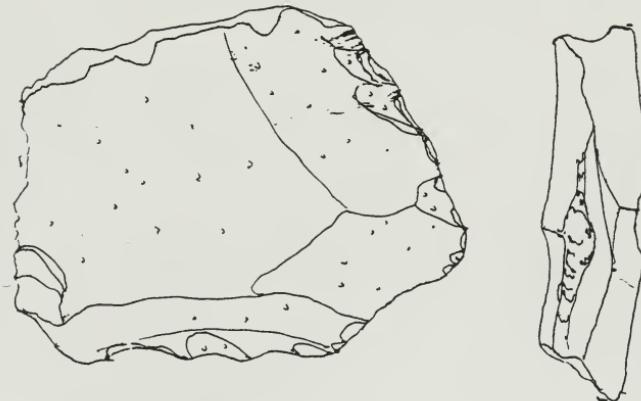
Small chopper

## Panamint Quarry

FIGURE IX: 27

Panamint #364-196 Chopper

FIGURE IX: 28



L	W	T	Wt
17	14	3.6	2 lbs. 14 3/4 oz

INY-20

Scale: 1/2 size

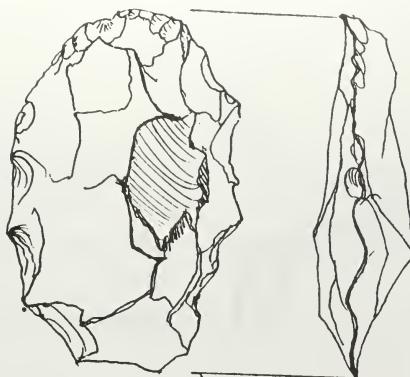


FIGURE IX: 29

L	W	T	Wt
7.0	4.3	1.6	1 3/4 oz

used biface (chopping tool)

## Panamint Quarry Workshops

Panamint # 364-186

L	W	T	Wt
7.1	3.9	3	4 oz

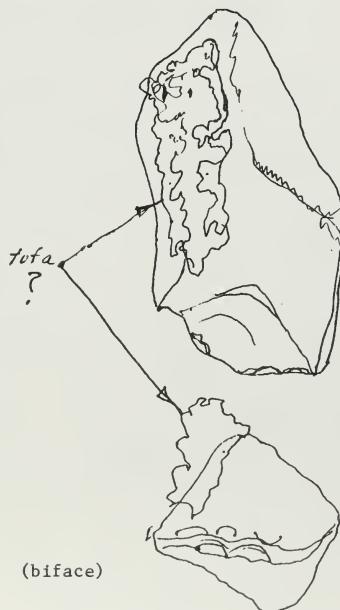
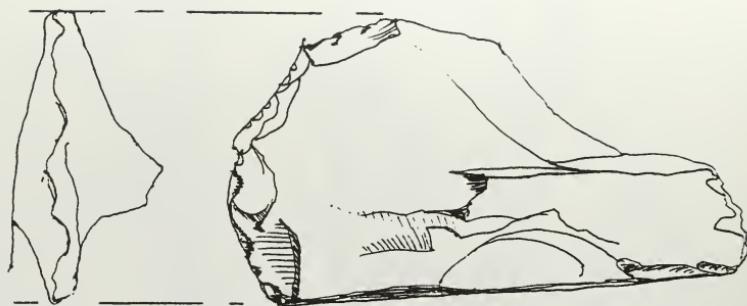


FIGURE IX: 30

Small chopping-tool (biface)

Panamint #364-118

rounded end Cleaver



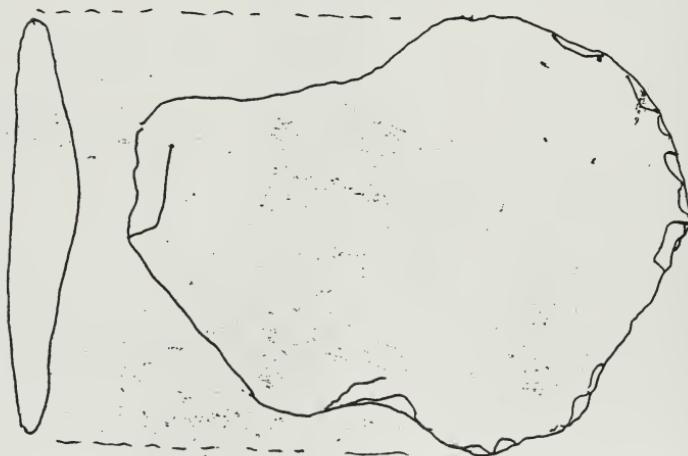
Scale: full size

L	W	T	Wt
10	5.5	1.8	3 oz

## Panamint Quarry

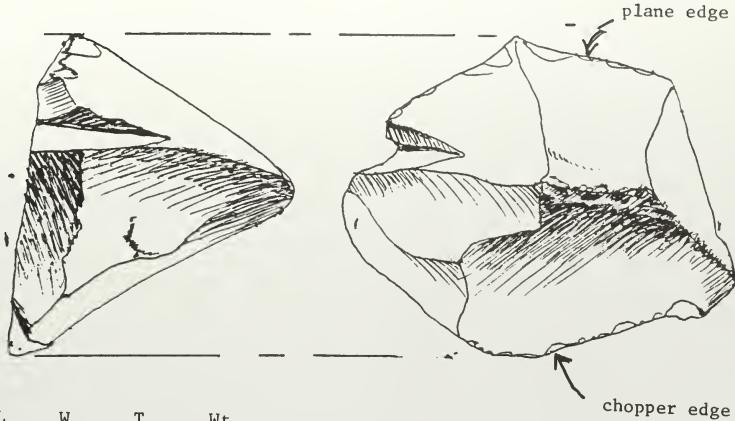
FIGURE IX: 31

Panamint #364-45 Cleaver



L	W	T	Wt
10.5	8.4	2.1	5 3/4 oz

FIGURE IX: 32



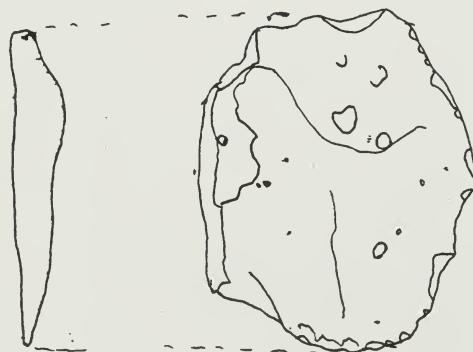
L	W	T	Wt
14	13	10.6	5 lbs

Scale: 1/2 size

FIGURE IX: 33

## Panamint Quarry

Panamint # 364-112



L	W	T	Wt
10.9	12.3	2.5	11 3/4 oz

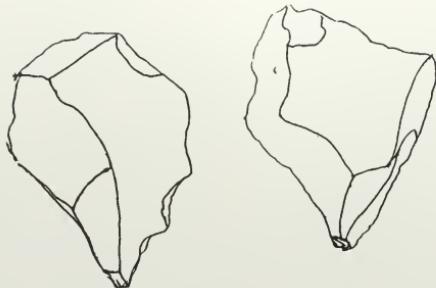
Chopper Scale: 1/2 size

FIGURE IX: 34



BEAKS OR BORERS

Figures 35-39



L	W	T
4.5	3.5	0.5

Three Beaks

FIGURE IX: 35

## Panamint Quarry

Panamint SBCM #796 INY-19, Pls-1

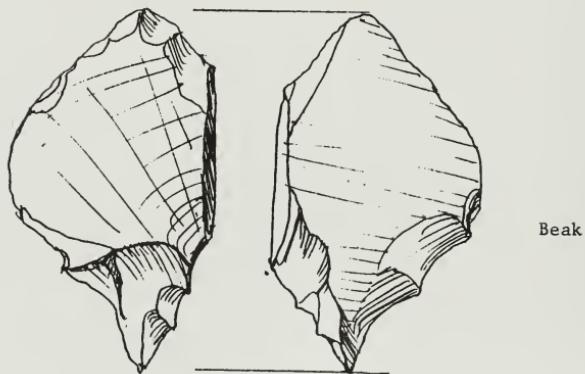
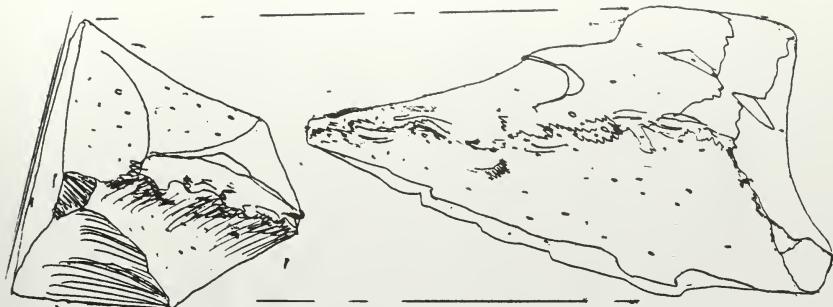


FIGURE IX: 36

L	W	T	Wt
6.4	3.7	1.2	3/4 oz



L	W	T	Wt
32	16	15.5	15 lbs(?)

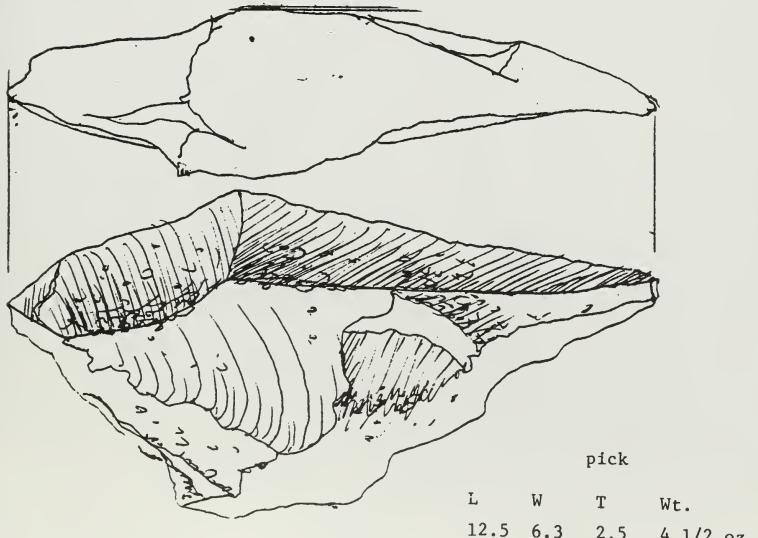
Note: has 2 supraposed layers of calcareous  
deposit on underside. Quarry workshop  
INY-4K Scale 1/3

FIGURE IX: 37

## Panamint Quarry

Panamint SBCM-796 Iny-21, Pls-3

FIGURE IX: 38

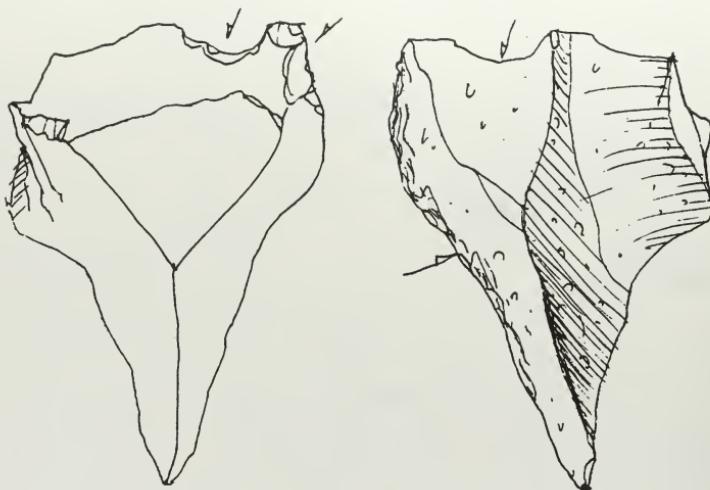


pick

L	W	T	Wt.
12.5	6.3	2.5	4 1/2 oz.

Panamint SBCM 795, INY-20, PIs-2

L	W	T	Wt
9.0	6.0	2.2	2 3/4 oz

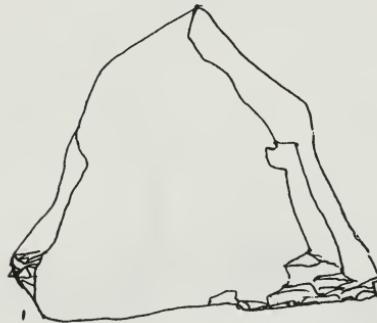


multipurpose tool

FIGURE IX: 39

## Panamint Quarry Workshops

FIGURE IX: 40



Panamint SBCM #796 INY-19 PIs-1

L	W	T	Wt
7.7	6.8	5.6	10 1/4 oz

Core-plane or platform core

SPOKESHAVES

Figures 41-45

Panamint # 364-138 Large spokeshave

L	W	T	Wt
9.8	5.8	1.8	3 1/2 oz

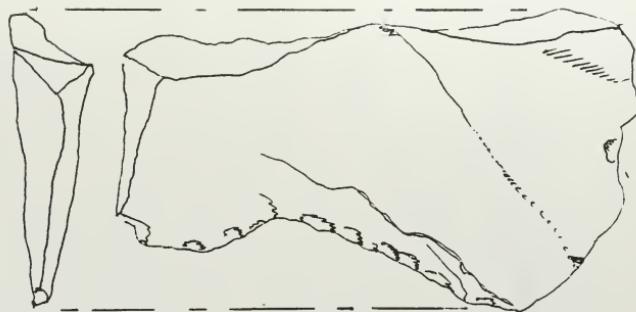


FIGURE IX: 41

## Panamint

## Quarry

Panamint #364-113

Rounded end-scraper, spokeshave

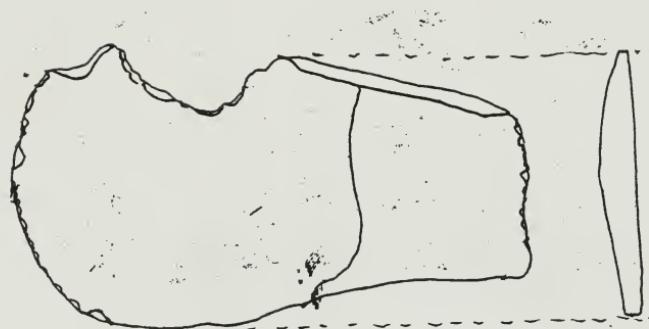
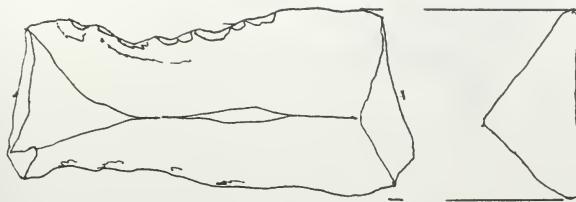


FIGURE IX: 42

L	W	T	Wt
38	19	2	4 lbs +

Scale: 1/4 size

205



Panamint #364-51

L	W	T	Wt
15.5	8.2	3	15 1/2 oz

Scale: 1/2 size

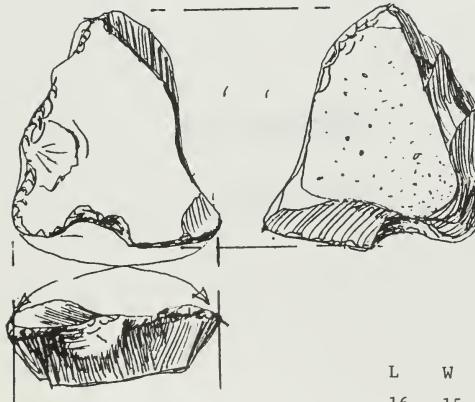
Spokeshave

## Panamint

## Quarry

Panamint # 364-6

Notched fabricator - spokeshave



L	W	T	Wt
16	15.2	5.8	4 lbs 2 oz

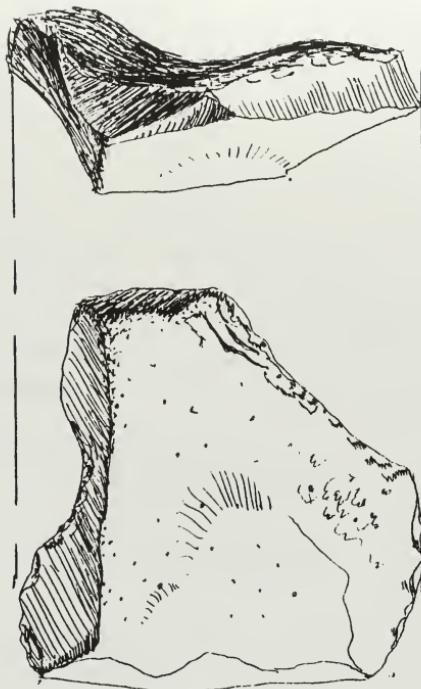
Scale: no scale

FIGURE IX: 44

Panamint # 364-35

Notched fabricator spokeshave

Scale 1/2 size



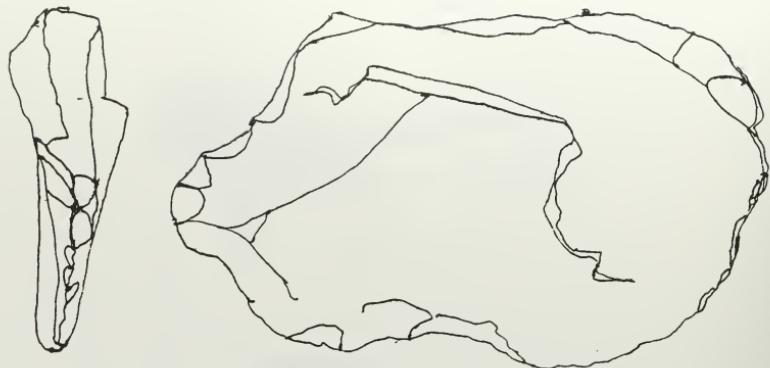
L	W	T	Wt
15.5	15.5"	4.5	3 lbs.

## Panamint Quarry

FIGURE IX: 45

PICKS OR ADZES

Figures 46-53



Small, beaked proto-hand axe (pick?)

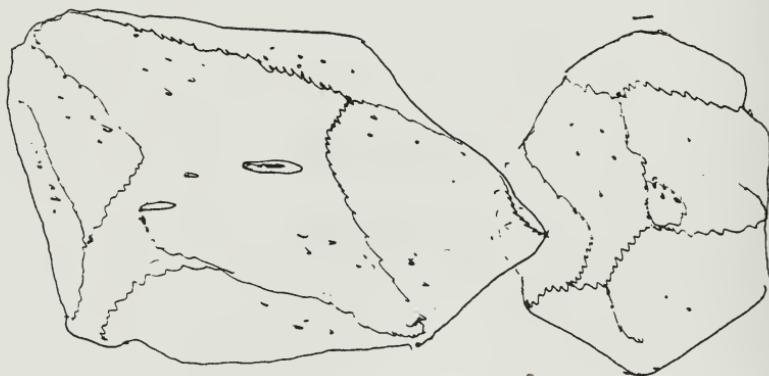
in Wash

L	W	T	Wt
11.6	6.7	2.4	9 oz

## Panamint Quarry

FIGURE IX: 46

Panamint #364-166 Small pick



L	W	T	Wt
10.8	6.5	6.5	1 lb 2 1/4 oz

FIGURE IX: 47



Scale: 1/2 size

L	W	T	Wt
15	12	6	2 lbs 3 1/4 oz

## Panamint

FIGURE IX: 48

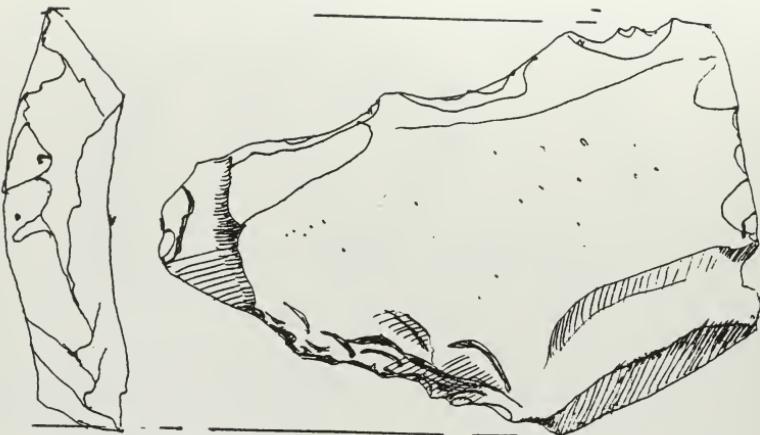
## Quarry

FIGURE IX: 49



L	W	T	Wt
15.5	10	3.2	1 lb 5 1/4 oz

Panamint #364-36  
Pick L W T Wt  
22 15.5 36 31bs 12oz



Panamint

FIGURE IX: 50

Quarry



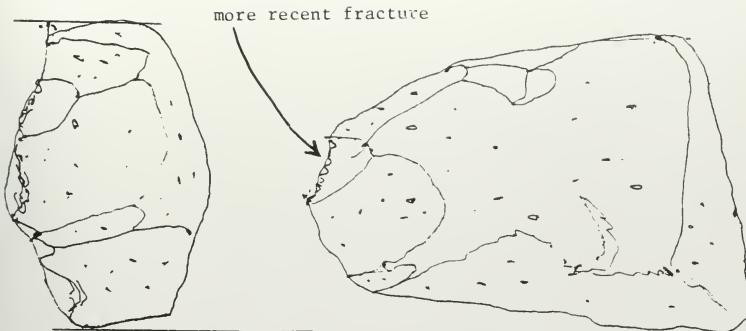
Panamint # 364-193 Pick

L W T Wt  
9.7 9 2.2 8 1/4 oz 211

FIGURE IX: 51

Panamint # 364-165  
L W T Wt  
16.5 11.7 7.3 31bs 10 oz

Pick



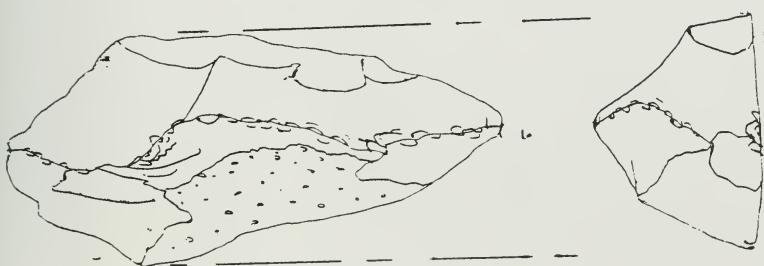
## Panamint Quarry

FIGURE IX: 52

Panamint # 364-33

Iny-4K Quarry workshop

Anvil or sledge



L W T Wt  
30.5 11 12 10 oz

FIGURE IX: 53

Scale 1/3 size

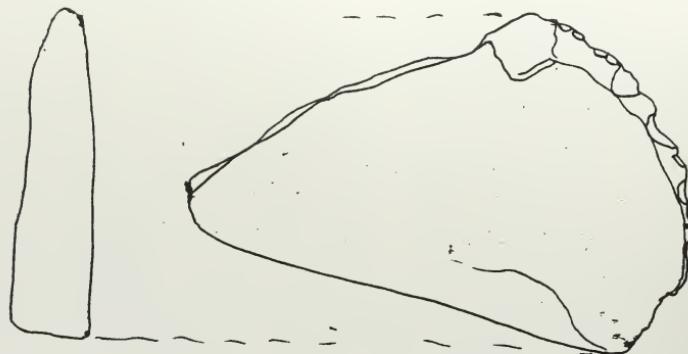


CLEAVERS OR WEDGES

Figures 54-57

## Cleaver

Scale: 1/2 size



L	W	T	Wt
18.8	12	3	1 lb 15 oz

Note: this tool probably washed down  
from above.

## Panamint

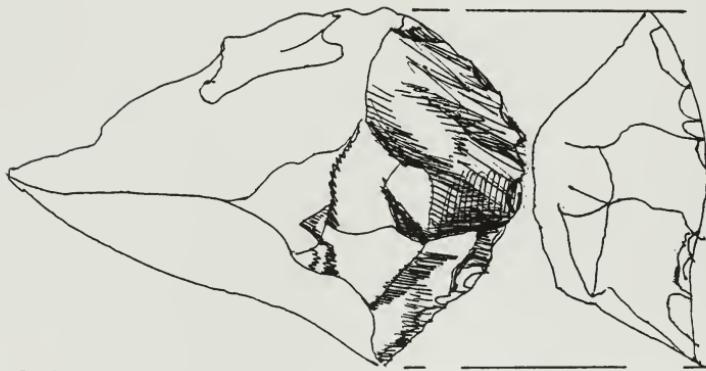
FIGURE IX: 54

## Quarry

Panamint #364-53

## Cleaver

FIGURE IX: 55

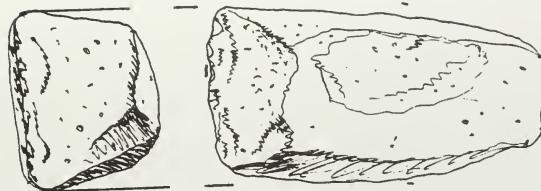


Scale: full size

L	W	T	Wt
9.8	6	3	4 1/4 oz

Panamint # 364-114

L	W	T	Wt
19.6	12.1	2.0	2 lbs 6 1/4 oz



Cleaver Scale: 1/2 size

FIGURE IX: 56

Panamint

Quarry

Panamint #364-129 Cleaver

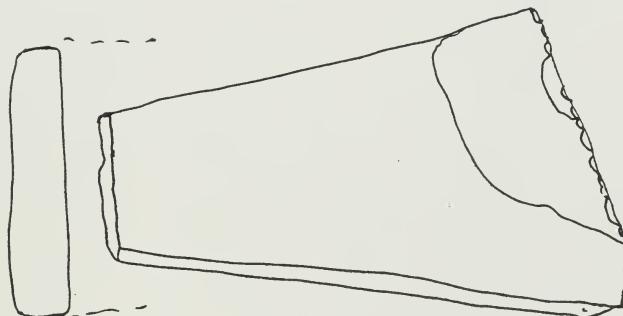


FIGURE IX: 57

L	W	T	Wt
13.5	7.4	5.5	1 ob. 13 oz

Scale: 1/2 size



MACROSAW

Figure 58



THIS BASALT SAW WITH COARSE TEETH IS NEARLY 30cm IN LENGTH. IT IS AN UNUSUALLY GOOD EXAMPLE OF THE EXISTENCE OF SPECIALIZED WOODWORKING AND PRACTICE OF THIS ART AT THE PANAMINT WORKSHOPS.

FIGURE IX:58

WEATHERED MACROLITHS

Figure 59

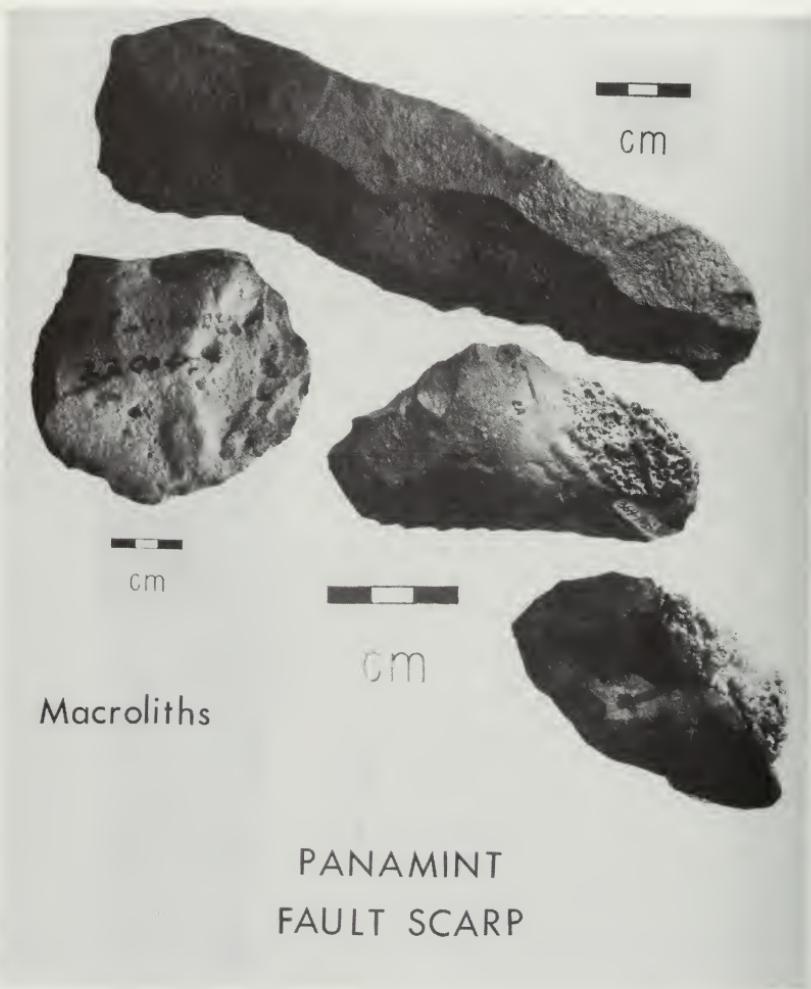


Figure IX:59. Top: thinned knife of bifacial tradition, heavy weathering.  
Below: tools of macrolith traditions extreme weathering and tufa encrustation.

LAKES COUNTRY CHRONOLOGY

China Lake, Little Lake and Panamint Valley

Figure 60



### China Lake



## Little Lake



Panamá

## CDCA      MASTER      CHRONOLOGY

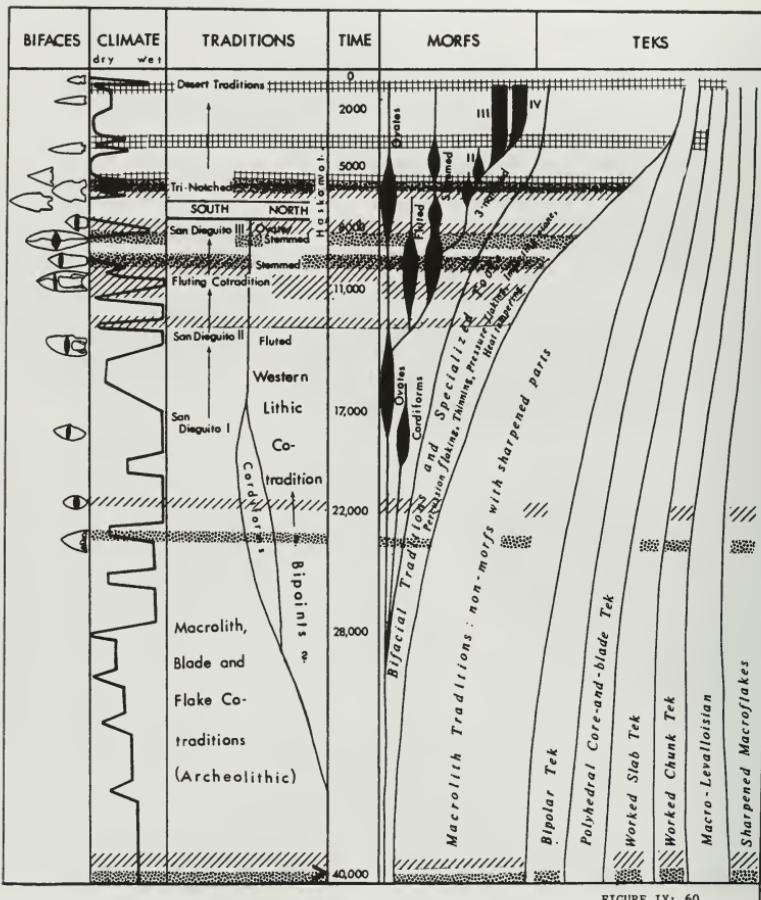


FIGURE IX: 60

Haskomat Morfs and Teks that are absent in Panamint Valley.

Lake China cultural assemblages range from Pinto (tri-notched I) to Archeolithic (Figure IX:61a reading from the top, row 2, "Diagnostic tools"). Included in this sequence are: archeolithic flake, core and macrolithic industries (Figures IX:62-64). Specifically, a late Wisconsin tool kit, including large crude crescents, thick stubby bi-points, broad beaks, incipient spur beaks, chopping tools, choppers, saws, single shouldered knives, and large rounded end scrapers (Figures IX:65-85); proto-Lake Mojave Clovis sequence of tool kits (Figures IX:86-94) characterized by Sandia-like points, core tools, chopping tools, adzes, slug scrapers, Levallois ridge backs, and stemmed two-shouldered knives and a classic Lake Mojave-Clovis tool kit which is itemized in Table 16 with tools shown in Figures IX:95-117. The Early Pinto I tool kit includes crescents, crescentics, large tri-notched points, broad beaks, spur beaks, round end scrapers, side scrapers, shredders, saws, micro-blade cores and curved, shouldered knives (Figures IX:118-131).

Assignment to these different cultural stage categories has been based on three criteria: teks, morfs and weathering. This last criterion (weathering) is illustrated as a classifying device by Figure IX:132. Figure IX:132a, a classic Lake Mojave-Clovis object, shows slight weathering (lightly frosted); Figure IX:132b, a late Wisconsin chopper, shows heavy weathering; Figure IX:132c is an archeolithic single-shouldered knife showing extreme weathering. Surface alteration in artifacts is of three kinds: a) chemical weathering in which the chemical composition of the stone is altered and de-vitrification takes place; b) physical weathering in which sand blasting erodes the surface, and c) patination, a superficial color change caused by formation of a clay skin which attracts an iron manganese stain

on the upper surface (dark brown to black) with a largely iron stain (red) on the under surface.

Figure IX:3 shows that cultural manifestations at China Lake extend over miles of space, rather than meters as at Lake Panamint. However, sites are associated with similar landscape features, e.g., lakeshore and adjoining ridges. They all existed along a marsh/dry lands interface; whereas in Lake Panamint, sites are associated with four different geologic formations: dunes; marsh/dryland interface; a tectonic fault scarp; and very ancient pavements on fan deposits. The relict fans (some of which must be "at least 50,000 years old") (Pierre St. Amand of China Lake, personal communication, 1979) are all of Class I sensitivity (destructability) and pre-historic importance. They provided the smooth, secure, water-abandoned surfaces on which Paleo and Archaic Shamans directed the construction of giant ground figures (Davis and Winslow, 1965). These ground inscriptions (see Section X-c, "Three Great Serpents") can be decoded (like any other rare manuscript), interpreted in their cultural contexts and become part of our own rich heritage. If we lay them open to destruction by miners and bikers before they have been completely documented by aerial photography and plane table mapping, we deliberately erase cultural masterpieces probably twice as old as those in South America.

The Mojave Desert ground figures may supply a temporal base for large-scale forms of religious art in the New World.

Figures IX:133-138 give a final overview of PaleoIndian artifacts from three of the Panamint environments plus Hunter Mountain--a massif with pinyon forests that dominates the northern end of Panamint Valley. With two exceptions from Lake Hill Island (B and F in Figure IX:137) all artifacts

are products of the Panamint Basalt Industry, a series of quarry workshops along the northeast fault scarp. Figure IX:137B is of agate--a Clovis crescent from Site INY-19. The Clovis attribution is given because it was found on the island fan a short distance from a fine Clovis base made of identical material. Note that the Lake Mojave crescents from the same locus show slightly rougher, percussion flaking. Figure IX:137F is a Silver Lake point/knife made from obsidian (another non-local material). Like the Clovis crescent, it has been finished by pressure flaking.

Another outstanding pressure flaked specimen in this series is shown in Figure IX:136B. The diagonal pressure flaking is reminiscent of late PaleoIndian work from the Great Plains. Most other artifacts from all the site areas are, by comparison, roughly made and are little more than usable blanks.

Crescents (Figure IX:137A, 137B, 137C, 137E) came from the lakeshore as did the single fluted base (not photographed). Crescents and Clovis knife/points are usually associated with water.

TABLE 16  
A CLASSIC LAKE MOJAVE/CLOVIS TOOLKIT

IMPLEMENTES

A few blades  
Stemmed knives with one shoulder  
Stemmed knives with two shoulders  
Crescents  
Crescentics  
Saws  
Shredders  
Mini- and micro-spokeshaves (for baskets?)  
Broad beaks  
Spur beaks (with tiny spurs)  
Steak knives (with tiny denticulations)  
Fluted knife/points  
Small, tanged end-scrappers with high-angle bits  
Women's work tools (generalized)  
Bone tools (?)  
Pounding/grinding handstones

ESTHETIC SIGNATURES

Exquisite workmanship  
Selection of only the finest local and regional stone.  
These people were the goldsmiths of the American  
Upper Paleolithic.  
Heat tempering of stone

TABLE 17. NORTHERN DESERT CHRONOLOGY

An inventory of hypothetically seriated tools from China Lake. Weathering, technology and relative position in the erosional levels of the section are seriation criteria (Davis, 1978:38-39).

Cultural association	Tool Inventory	Stone technology	Weathering
A. Early and Late Core Traditions, Asian cordiform and ovate weapons Est. 45,000 to 25,000 years B.P.	* Choppers * Chopping tools * Large spokeshaves * Stubby, broad beaks * Long, ovate knife/points * Cordiform knife/points * Large flake tools * Bone tools and weapons? * Pounding/grinding rocks	* Rock smashing * Coarse, irregular percussion * Chert and volcanic rock preferred * No use of obsidian	* Extreme Deep pitting and scouring of all flake scars--softer material or flaws removed by devitrification * Many flake scars obliterated
(Note: there is a marked change in the artifacts at this point)			
B. Late Wisconsin Cultures: I Ovate weapons continue Est. 25,000 to 20,000 years B.P.	* Fewer, smaller choppers and chopping-tools * Spokeshaves more varied in size * Broad beaks diversify into long-borer and triangular forms * End scrapers * Crescents	* Smaller, more refined tools * Irregular, percussion * Jasper and volcanic rock preferred, rhyolite in evidence * No obsidian	* Heavy erosion due as much to chemical as to physical weathering * Flake scars sanded and pitted

(Cont'd)

TABLE 17. Continued

Cultural association	Tool inventory	Stone technology	Weathering
	<ul style="list-style-type: none"> <li>* Crescentic scrapers</li> <li>* Long ovate knife/points</li> <li>* Ovoid "biscuit" scrapers</li> <li>* Valsequillo knife/points (small cordiforms)</li> <li>* Pounding/grinding rocks</li> <li>* Bone tools and weapons</li> </ul>	<ul style="list-style-type: none"> <li>* Tool classes as above with additions:</li> <li>* Composite small tools</li> <li>* Obsidian introduced</li> <li>* Crescents become diversified</li> <li>* Spur beaks (gravers)</li> <li>* Slug scrapers</li> <li>* Many broad beak styles</li> <li>* Side-knives (scrapers) more specialized</li> <li>* "Cutters" become more numerous</li> <li>* Bone points and tools?</li> </ul>	<ul style="list-style-type: none"> <li>* Irregular percussion flaking</li> <li>* Refinement and smaller size</li> <li>* Pressure retouch</li> <li>* Stemmed-ovate forms appear</li> <li>* Lake Mojave and San Dieguito knife/points established</li> </ul> <p><i>C. Late Wisconsin Cultures: II</i> Ovate weapons continued Est. 20,000 to 15,000 years B.P.</p> <ul style="list-style-type: none"> <li>* Heavy to moderate weathering</li> <li>* Flake scars clearer except on obsidian</li> </ul>
			(Cont'd)

TABLE 17. Continued

Cultural association	Tool inventory	Stone technology	Weathering
D. Proto-Clovis Cultures New, lanceolate knives added to ovate forms Est. 15,000 to 13,000 years B.P.	<ul style="list-style-type: none"> <li>* A few blades</li> <li>* Microflake cores?</li> <li>* Long, lanceolate knife/points of Sandia pattern</li> <li>* Crescents more varied</li> <li>* Crescents more varied</li> <li>* Spur and broad beaks more</li> <li>* Stemmed tools with specialized two shoulders appear</li> <li>* Stemmed knife/points with flutes</li> <li>* Mini- and micro-spokeshaves (for baskets?)</li> <li>* Saws</li> <li>* Shredders</li> <li>* "Steak knives"</li> <li>* Pounding/grinding rocks faceted</li> </ul>	<ul style="list-style-type: none"> <li>* Increased cultural interaction, loans and innovations</li> <li>* Greatly extended use of flake tools</li> <li>* New technology used: use of punch or hard wood flaker to remove wide, thin spalls</li> <li>* A second technological innovation appears: basal flutes</li> <li>* Heat treatment of silicate stone</li> </ul>	<ul style="list-style-type: none"> <li>* Sand blasting and chemical alteration, but flake scars clearer than previously</li> </ul>
E. Classic Clovis Phase	<ul style="list-style-type: none"> <li>* (All above tools plus general refinements)</li> <li>* Lanceolate tools proliferate</li> <li>* Women's work tools</li> <li>* Refined steak knives</li> </ul>	<ul style="list-style-type: none"> <li>* Stone technology reaches a peak of sophistication: signatures are a) choicest stone</li> </ul>	<ul style="list-style-type: none"> <li>* Moderate to light sand blasting</li> <li>* Flake scars clear</li> </ul>

(Cont'd)

TABLE 17. Continued

Cultural association	Tool inventory	Stone technology	Weathering
	* Micro-tools common	* b) heat treatment * c) exquisite workmanship	
	* Fluted knife/ points diversify	* Fine obsidian	
	* End scrapers	popular	
	* Targeted		
	* Pounding/grinding		
	rocks more		
	specialized		
	* Bone tools?		
	* Micro-shredders		
	and spokeshaves		
F. <u>Pinto Phasse</u> Est. 5,000 years to 3,000 B.P.	* Serrated and notched weapons appear	* Obsidian predominant	* Light sand blasting
	* Basic, PaleoIndian toolkit continues	* Flake scars narrower and less	
	except for hunting/ butchering gear	refined	
		* Heat treatment	
		disappears	
G. Cultural gap? (Arid climate returns)	* Elko, Cottonwood and Rose Spring points	* "Desert Culture" technologies	* Obsidian bright and unsanded
2,500 years B.P.	* Milling		
	* Basketry		
H. <u>Proto-Historic</u> <u>Shoshoni</u>	* Desert side-notched	* Desert Culture	* No visible weathering
2,000 B.P. to present time	* Rose Spring points	adaptations vary with climatic cycles	
	* Cottonwood points		
	* Basketry		
	* Milling		
	* Pottery after AD 1,700		

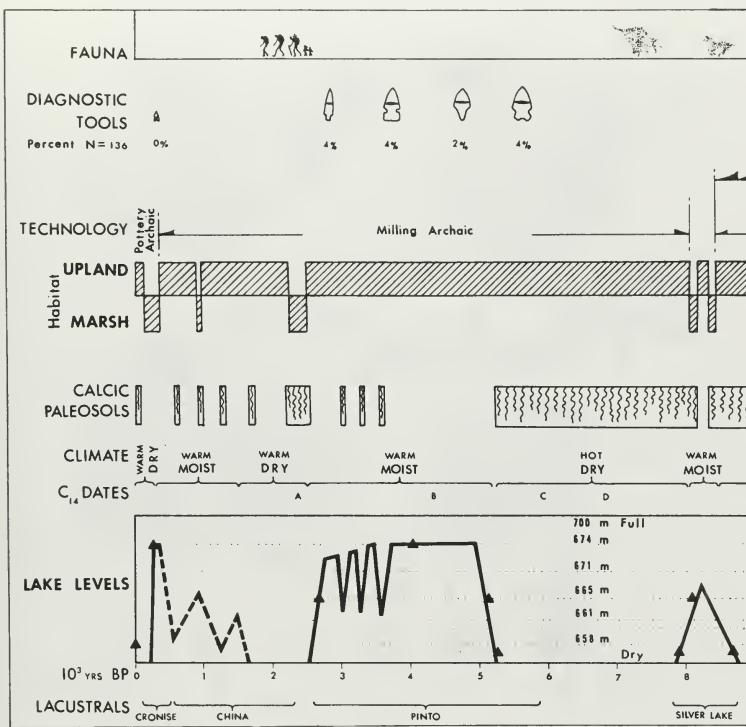


FIGURE IX:61a

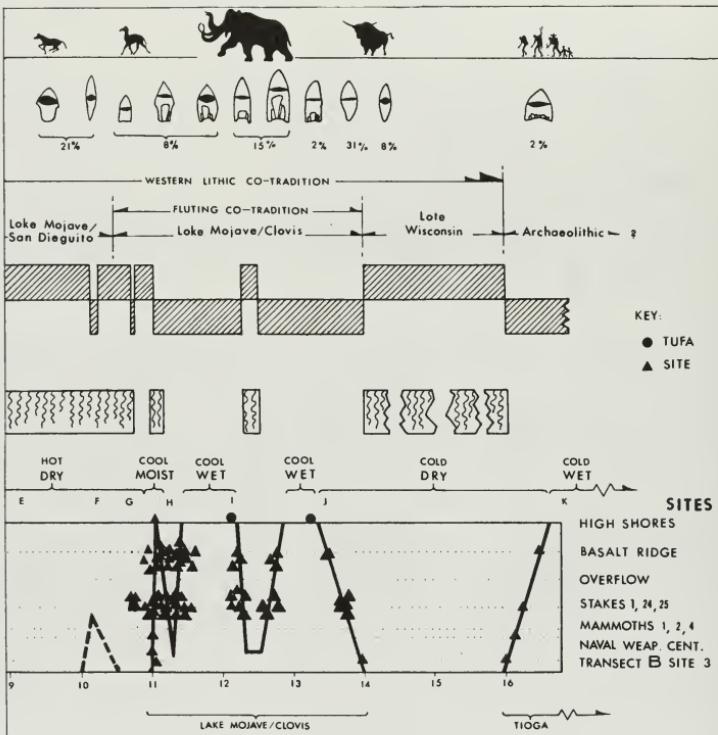
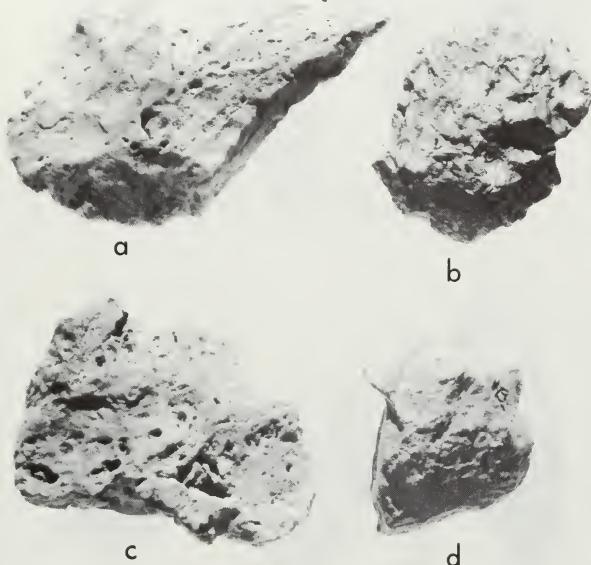
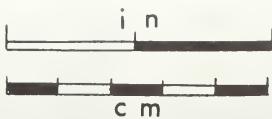


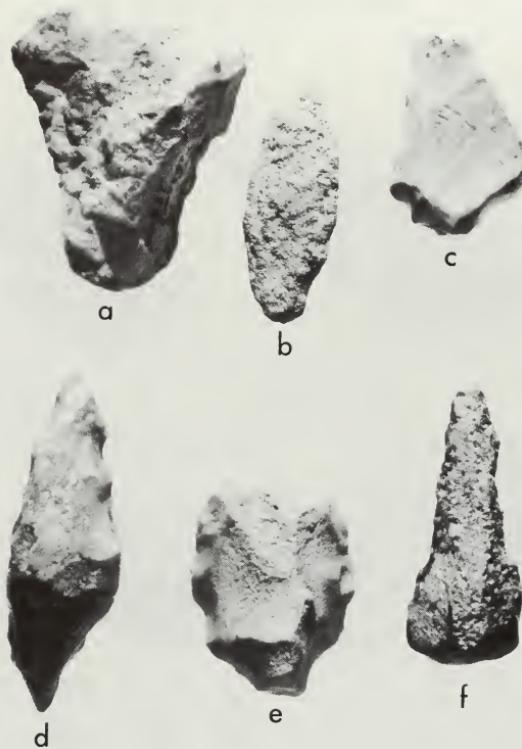
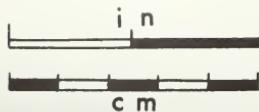
FIGURE IX:61b



Artifacts of a postulated Core Tool Tradition from the basin of  
Pleistocene Lake China. "(a) Fragment of chopping tool with spokeshave at top,  
chalcedony. (b) Biscuit scraper with spur beak, jasper. (c) Chopper fragment,  
chalcedony. (d) Spur beak, jasper"

DAVIS 1978c: 10

FIGURE IX: 62.

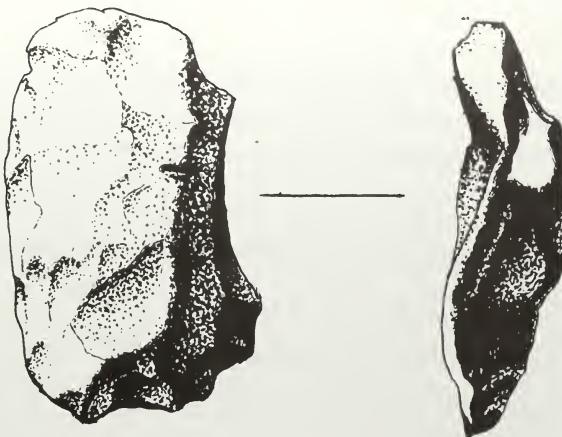


Artifacts of "Late Wisconsin Cultures I, basin of Pleistocene Lake China.

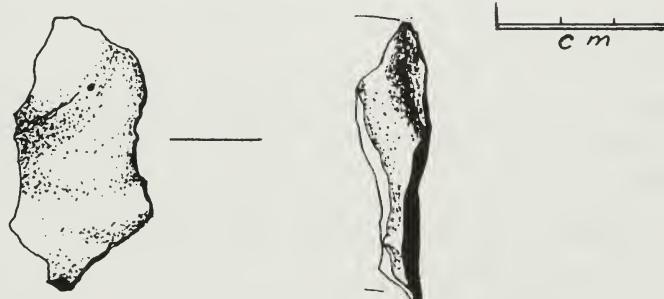
(a) Large end-scraper with spur beak left side, chalcedony. (b) Long ovate knife point, rhyolite. (c) Four sided scraper, chalcedony. (d) 'Slug' scraper, chalcedony. (e) Biscuit scraper, chalcedony. (f) Broad beak, long borer, chalcedony"

DAVIS 1978c: 10

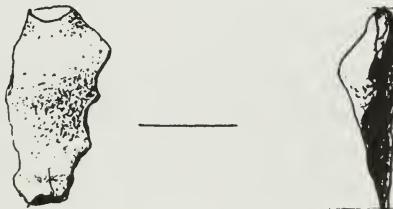
FIGURE IX: 63



CHOPPER, FOUND AND PHOTOGRAPHED WITH BONES  
OF A PROBOSCIDEAN, CHINA LAKE, INYO CO. CA.



WEATHERED JASPER FLAKE, FOUND 10 FT. SW OF  
PROBOSCIDEAN JAW AND TEETH.



Note that the following sequence of dimensioned sketches of China Lake artifacts are classed according to criteria of degree of weathering; task-capability; and (in a few cases) morphology.

Weathering is recognized in five stages as follows:

- 1) None visible
- 2) Slight frosting (sand blasting)
- 3) Moderate frosting; incipient chemical pitting, scars obscuring
- 4) Heavy frosting; deep pitting scars disappearing
- 5) Extreme wear - gnarled, pitted and devitrified - nearly obliterated

Task-capability is piercing, scraping, sawing, slicing, chopping, pounding, etc.

Names applied to combinations of these criteria are intended to place the implements in time and/or in a known cultural stage, e.g.,

Pinto I (see Master Chronology Chart)

Lake Mojave/Clovis

Proto-Clovis

Late Wisconsin

Archeolithic (see Figure IX:132)

The "sketches" are actually reproductions of 5x8 reference cards on file with the senior editor and author (Davis). Although not highly finished, the drawings show adequately the relative degrees of pitting and blurring that characterize California Desert artifacts that are more than 10,000 years old. I have observed for years the following relative degrees of chemical/physical weathering:

FLUTED KNIVES ARE SLIGHTLY TO MODERATELY WEATHERED.  
THERE ARE, HOWEVER, CORE TOOLS, CHOPPERS AND PICKS  
THAT ARE EXTREMELY WEATHERED: THEY ARE PARTIALLY  
DEVITRIFIED AND DETAILING HAS BEEN OBLITERATED.  
THE SMALL, CURVED OR "CROOKED" KNIVES, USEFUL FOR  
SKINNING ARE FREQUENTLY MISTAKEN FOR POINTS.

China Lake/T 25S, R40E/ 28 C-Z

L-6.6 W-4.8 T-1.8

End scraper, brown jasper Considerable  
sandblasting Late Wisconsin Cultures

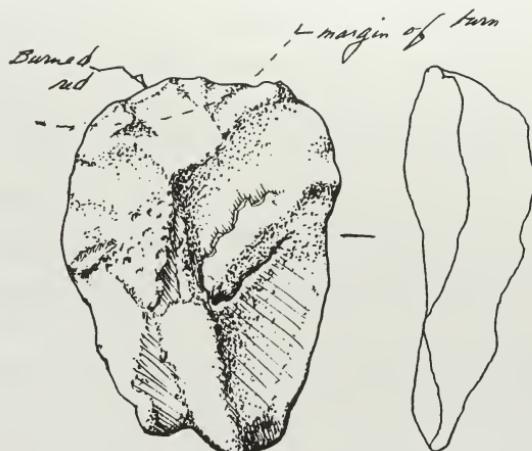
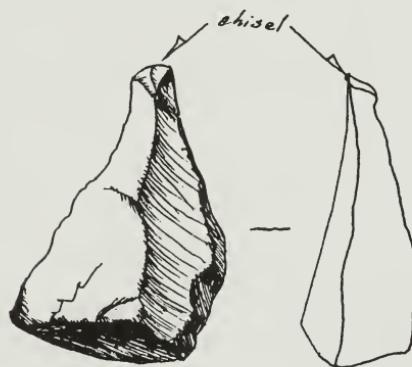


FIGURE IX: 65

## LATE WISCONSIN

FIGURE IX: 66



China Lake/Stake 22, Strip A-10

Clovis? L-5.2 W-3.4 T-1.6

Broad Beak Long borer style, with  
chisel tip Gray chert

China Lake/Stake 25 NW W?

L-5.4 W-2.7 T-1.0

Long Ovate knife/point

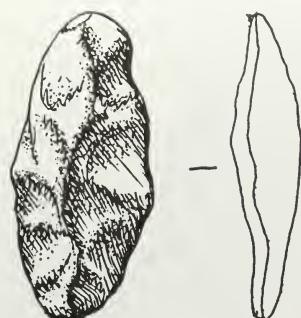
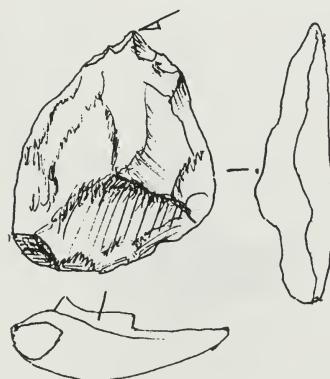


FIGURE IX: 67

obsidian Fairly regular, shallow  
percussion flaking Scars obliterated

## LATE WISCONSIN

FIGURE IX: 68



China Lake/ Stake 25

L-4.5 W-3.6 T-1.1

Chalcedony

Re-sharpened scraper with spur beak

China Lake/T 25S/R 40E/28A-24  
L-4.8 W-1.8 T-0.8  
Long ovate knife/point  
shouldered - 1(?) Rhyolite?  
Flakes obliterated, thick patination

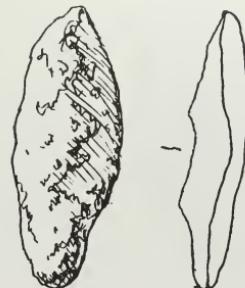
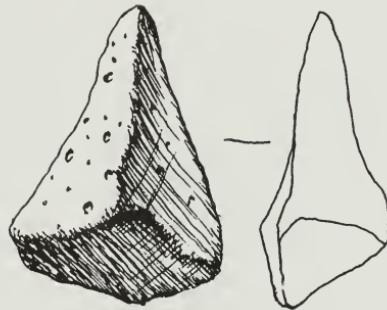


FIGURE IX: 69

## LATE WISCONSIN

FIGURE IX: 70



China Lake/Stake 22A - 11  
L-5.2 W-3.7 T-1.5  
Broad beak Long borer type  
gray rhyolite

China Lake/Stake 25 NW III

Core Tool Tradition

L-4.7 W-4.4 T-2.3

broad beak, triangular

25 NW III



Irregular, red Jasper, very weathered

Core tool with a) broad beak, triangular

b) double spur beaks, including

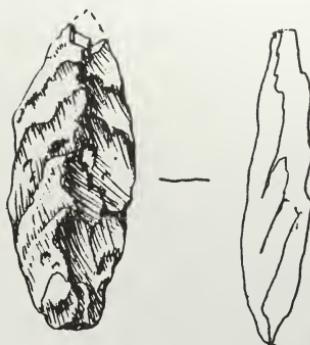
c) spokeshave

## LATE WISCONSIN

FIGURE IX: 71

China Lake/Stake 9/ C-28

L- > 5.5    W-2.2    T-0.9

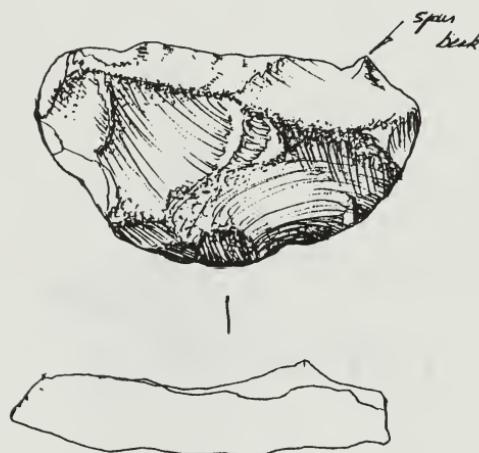


Knife/point - San Dieguito prototype  
Banded rhyolite

FIGURE IX: 72

## LATE WISCONSIN

FIGURE IX: 73



China Lake/Stake 8/Quad B-2

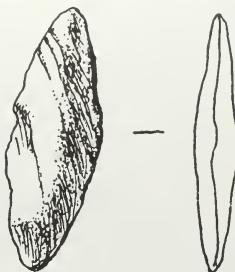
L-6.4    W-3.8    T-1.5

Chopping-tool Yellow-brown jasper

Moderately weathered Note break, upper right

China Lake/Stake 25NW WIV - 5

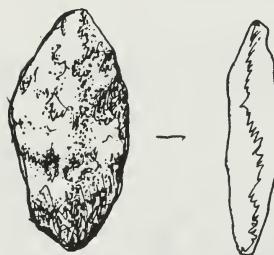
L-4.7 W-1.6 T-0.6



Knife/point Long ovate Banded rhyolite  
Flaking obliterated (percussion?)

FIGURE IX: 74

## LATE WISCONSIN



China Lake Transect B, Site 3, Section 10

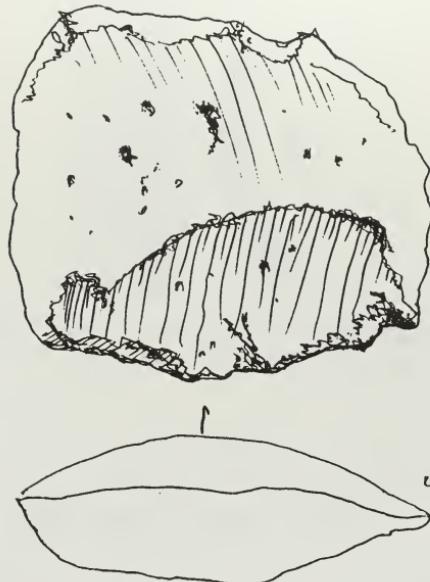
L-4.3 W-2.1 T-0.8

Lavender rhyolite

extremely weathered, all flake scars removed and  
surface pitted.

FIGURE IX: 75

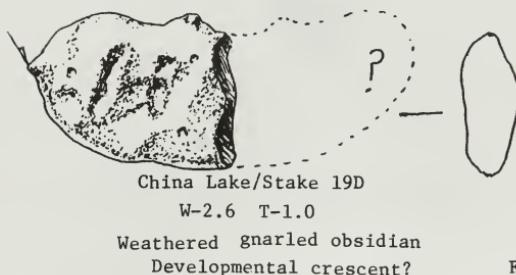
China Lake/M-184/CRBR Uncontrolled  
Collection Core Tool Tradition  
L-7.3 W-6.3 T-2.1



Chopper Porphyrytic andesite. Coarse and semi-vesicular; with phenocrysts  
Made on a Teshoa flake

FIGURE IX: 76

## LATE WISCONSIN



China Lake/Stake 19D  
W-2.6 T-1.0  
Weathered gnarled obsidian  
Developmental crescent?

FIGURE IX: 77

L-7.0

W-4.8

T-2.1

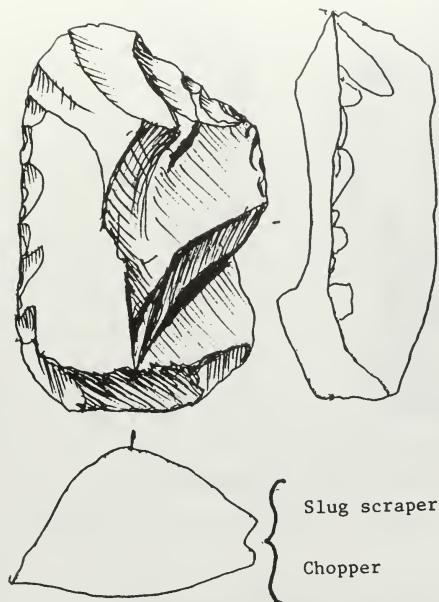
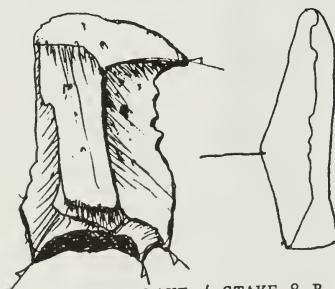


FIGURE IX: 78

Pinkish brown, banded rhyolite

## LATE WISCONSIN



CHINA LAKE / STAKE 8 B

L-4.5 W-2.6 T-0.8

COMPOSITE TOOL Three beaks

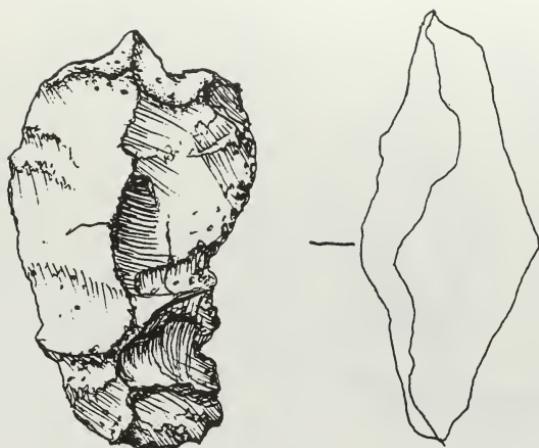
(Women's work area)

Gray Chalcedony

FIGURE IX: 79

China Lake/Stake 25NW, II-17

L-7.7 W-4.5 T-2.6



Core Tool Tradition

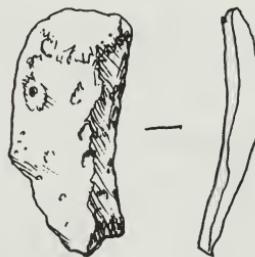
Chopping-tool /broak beak combination

White chalcedony Deeply patinated & eroded

FIGURE IX: 80

LATE WISCONSIN

FIGURE IX: 81



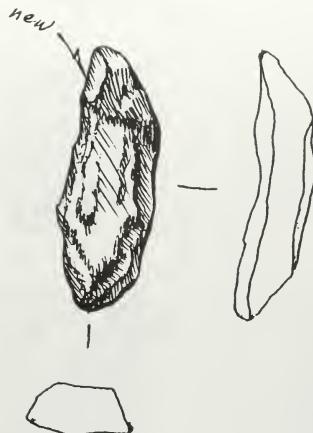
China Lake/Stake 25NW - IV

L-4.3 W-1.9 T-0.5

Flake cutter Keeled-1

Shouldered-1 Deeply patinated and  
eroded White chalcedony

China Lake/Quad C-11, Stake 19  
L-4.7 W-1.6 T-0.8

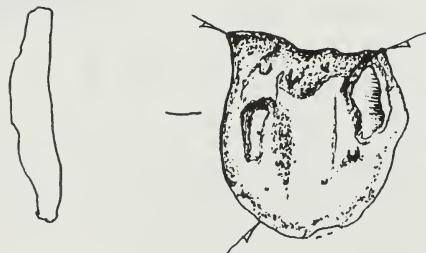


Knife/point or reduced ("slug") scraper  
Gray, banded meta-volcanic Heavily  
sandblasted Percussion flaking

FIGURE IX: 82

## LATE WISCONSIN

FIGURE IX: 83



China Lake/Stake 19/B-3  
L-3.6 W-3.2 T-0.7  
Round end scraper with 2 possible beaks.  
Purple rhyolite, deeply weathered

Panamint # 364-181

L	W	T	Wt
8.4	6.3	2	4 1/4 oz.

Knife and rounded end-scraper

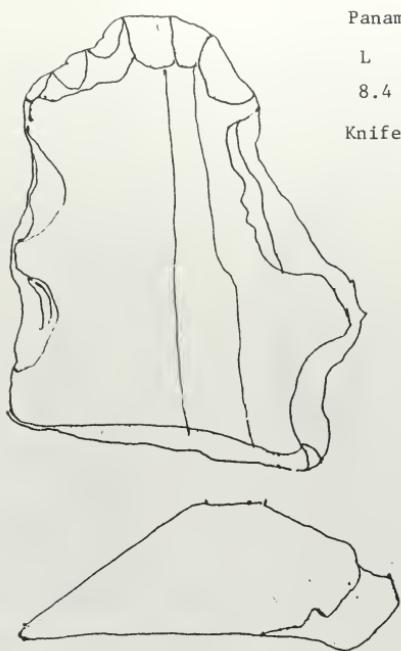


FIGURE IX: 84

## Panamint Quarry Workshops

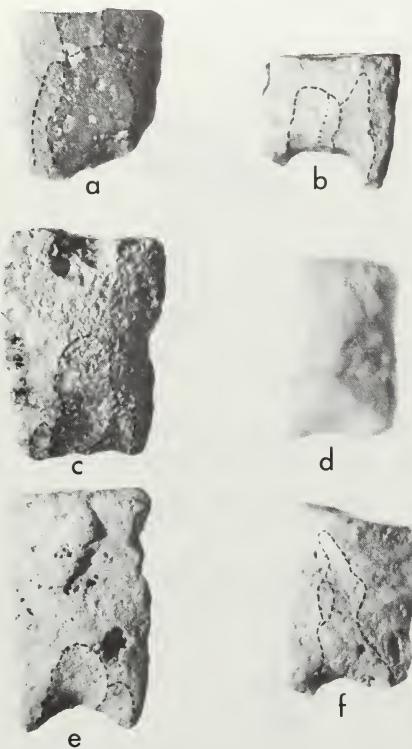
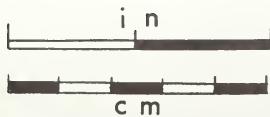
Panamint INY-19 Surface #364-1161



FIGURE IX: 85

macro-flake plane and core, basalt

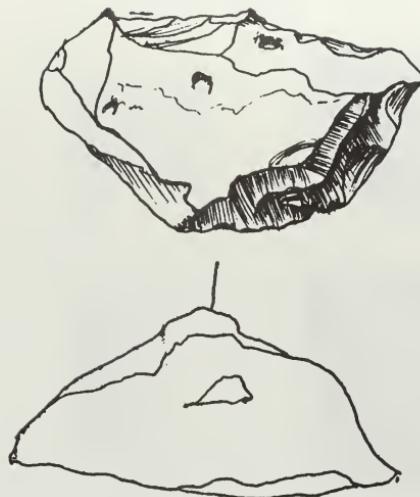
L	W	T
8.0	8.9	3.4



Artifacts of the "Proto-Clovis Phase" from the basin of Pleistocene

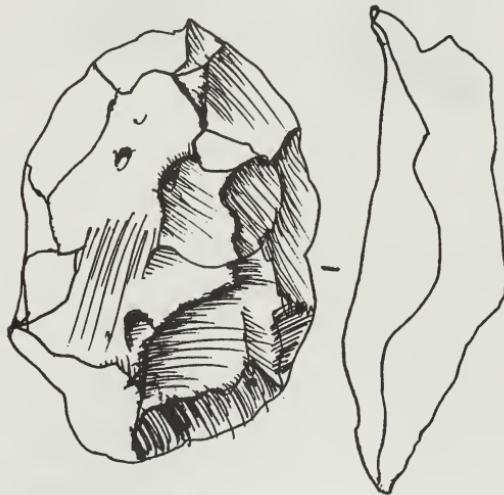
Lake China. "(a) Proto-Clovis base with shallow flutes, (2), chalcedony. (b) Knife/point base with 2 flutes, gray chert. (c) Large jasper knife with (3) flutes and 1 shoulder... (d) Base of knife/point, 1 shoulder right side..., chalcedony. (e) Knife/point base weathered, with shoulder and sub-shoulder recess (right), jasper. (f) Base of knife/point with 1 faint shoulder (left), pink chalcedony"

China Lake / 19 SW 1-7  
L-6.8 W-3.9 T-3.1  
Core/plane/chopper with beaks  
Vesicular jasper



## Proto-Clovis Early Fluting Co-Tradition

FIGURE IX: 87

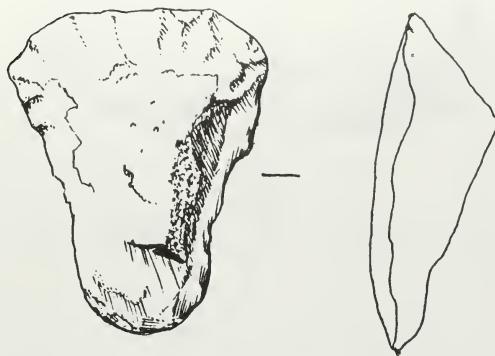


China Lake/General Surface/ T 25S, R 40E -28  
L-7.9 W-5.3 T-2.0  
Core Tool Tradition? Chopping-tool Basalt

FIGURE IX: 88  
249

China Lake/T 25S, R 40E/2A-215

L-5.8 W-4.7 T-1.8

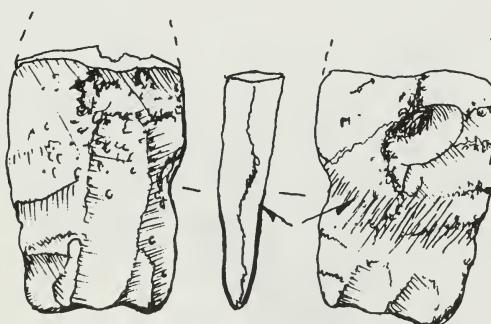


End scraper, white chert Considerable  
sandblasting Late Wisconsin Cultures

FIGURE IX: 89

## Proto Clovis

China Lake/ 9D-13/ (Stake 9) L->5.0 W-3.2 T-1.0



Knife/Point Jasper Fluted-1, thinned-1 Ancestral Clovis?

Note: base was thinned from side to side across the piece  
(small arrows) before it was thinned lengthwise by fluting.

FIGURE IX: 90

China Lake/T 25S, R 40E, 28A-308

L-8.6 W-3.0 T-2.3

"slug" scraper brown jasper Proto-Clovis?

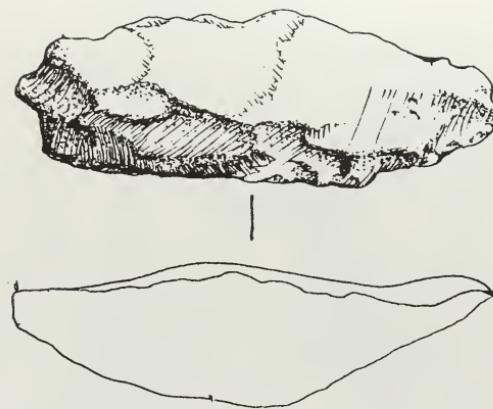
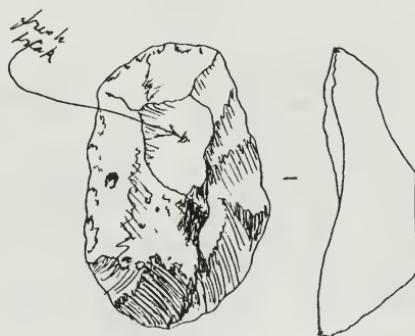


FIGURE IX: 91

## Proto Clovis

China Lake Transect B/Site 3 Section 3



L-5.0 W-3.2 T-1.3 "slug" scraper (or biscuit)

Sheep Springs agate Very weathered and patinated

FIGURE IX: 92

China Lake, Stake 25S, R 40E/ 28A-E

Core tool tradition?

L-7.6 W-4.4 T-2.0



FIGURE IX: 93

T 25S, R 40E, 28, E-1 BC #1 Artifact #1

Chert chopper, weathered, Found among  
bones of Mammoth #1

## Proto Clovis.

China Lake, M-154 (Basalt Ridge, Dry Lakes area) (Fagnant 1-A area)

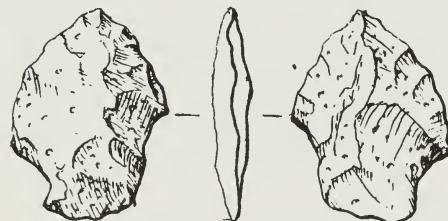


FIGURE IX: 94

L-3.7 W-2.3 T-0.7 Knife, basalt

An excellent example of a small cutter - or  
a "point" made for shooting around corners  
Too weathered to show use-wear

China Lake, NWC, North Range

KNIFE/POINT  
Obsidian  
Fluting Cotradition  
 $L > 3.8$      $W - 3.5$      $T - 0.9$

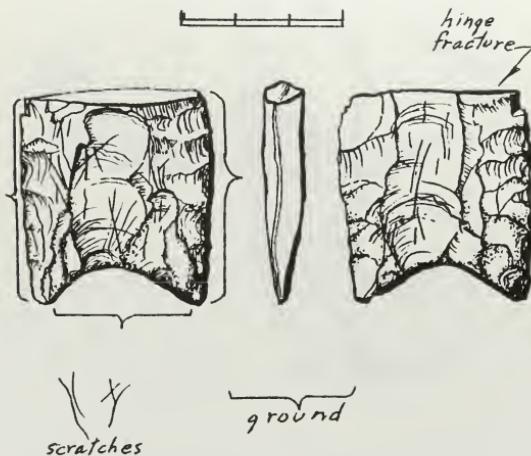
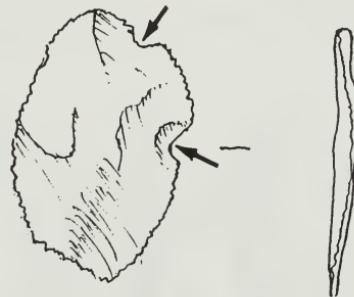


FIGURE IX: 95

## LAKE MOJAVE/CLOVIS

FIGURE IX: 96

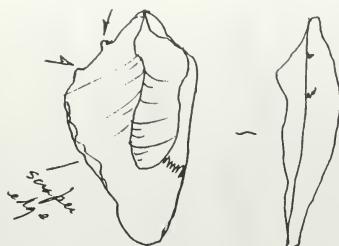


China Lake, Stake 19D

STEAK KNIFE w.SPOKESHAVES  
(A woman's implement?)  
 $L - 4.8$      $W - 3.1$      $T - 0.5$   
Fluting Cotradition

China Lake, Transect B. Site 3  
General Surface

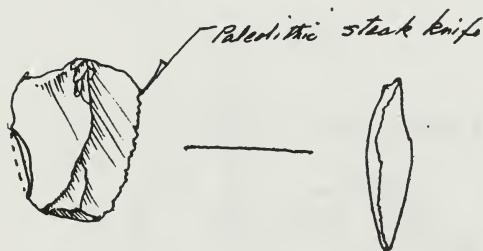
L-4.] W-2.3 T-0.6



Small, double spur beaked  
Chalcedony

FIGURE IX: 97

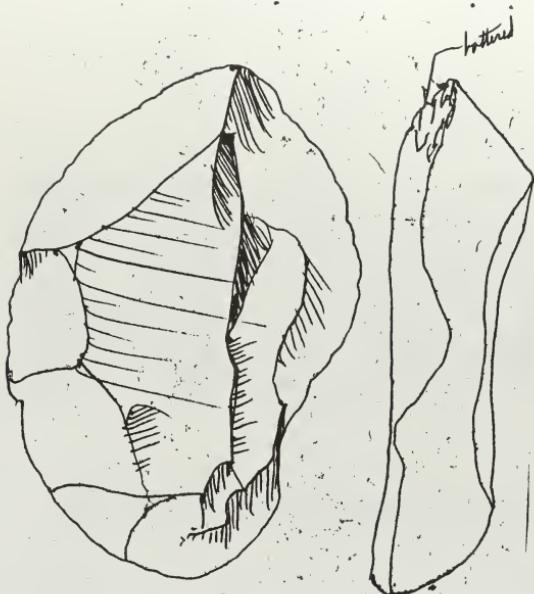
## LAKE MOJAVE / CLOVIS



China Lake, Stake 1D  
L-2.8 W-2.3 T-0.7  
Heat treated chalcedony  
Slight sanding  
Saw

FIGURE IX: 98

China Lake, Transect B, Site 3  
General Surface  
L-9.1 W-6.2 T-2.2



Gray chert  
Rounded end chopper  
(on a tabular slab)

FIGURE IX: 99

## LAKE MOJAVE/CLOVIS

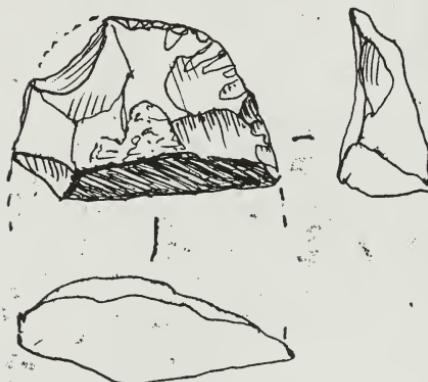
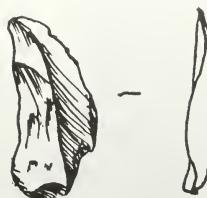


FIGURE IX: 100

China Lake, Stake 25  
L- ? W-4.5 T-1.5  
Sheep Springs agate  
Probably unifacial chopper

China Lake, Transect B, Site 3 Area A  
L-3.3 W-1.5 T-0.3(very thin)



Obsidian  
Flake cutter  
Keeled  
Shouldered

FIGURE IX: 101

## LAKE MOJAVE/CLOVIS

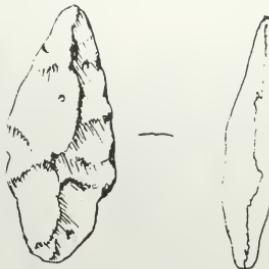


China Lake, Stake 22, Quad A, -70

L-3.6 W-].3 T-0.5  
Channel flake used and reshaped  
Flake cutter  
Keeled  
Shouldered

FIGURE IX: 102

China Lake, Stake 19, C-9  
L-4.6 W-2.0 T-0.6

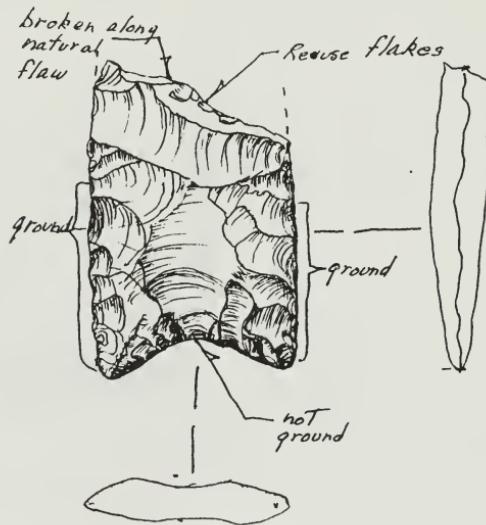


Red Jasper ?

Stemmed knife/point  
Percussion and pressure flaked  
Pitted and sand blasted

FIGURE IX: 103

## Lake Mojave/Clovis



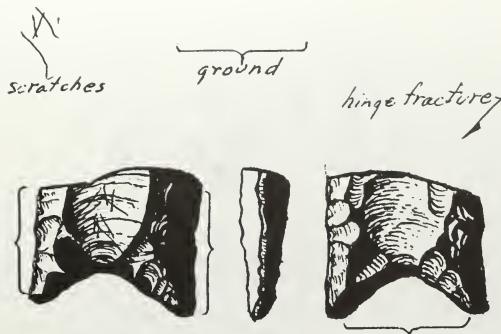
China Lake, Site Area M-184  
L-5.2 W-3.7 T-0.8

Agate  
Fluted base

FIGURE IX: 104

Haiwee Spring, Cactus Peak District

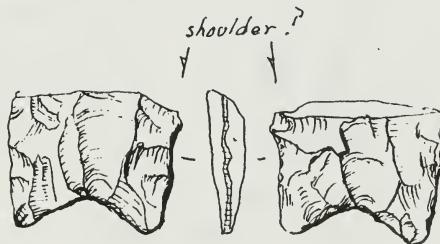
L- ?      W-3.0      T-0.6



Obsidian

FIGURE IX: 105

## Lake Mojave/Clovis



China Lake, Site Area M-184

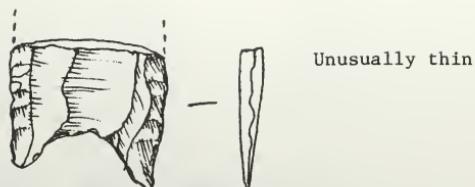
L- ?      W-3.0      T-0.6

Chalcedony (heat treated)  
Flake scars paper thin

FIGURE IX: 106

China Lake, Stake 25 NW

L- ? W-2.8 T-0.3

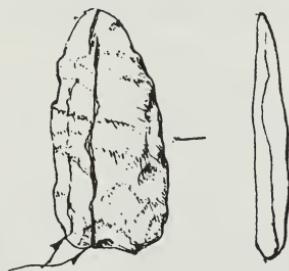


Lanceolate knife/point  
Gray chert

Fluted on two sides  
Patinated

FIGURE IX: 107

## Lake Mojave/Clovis



China Lake, Stake 25N

L-4.4 W-2.0 T-0.6

Knife/point

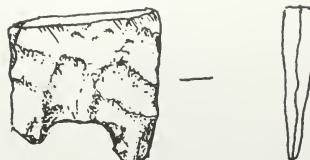
Gray chert

Pressure finished

FIGURE IX: 108

China Lake, Stake 1. A-0

L- ? W-2.7 T-0.5



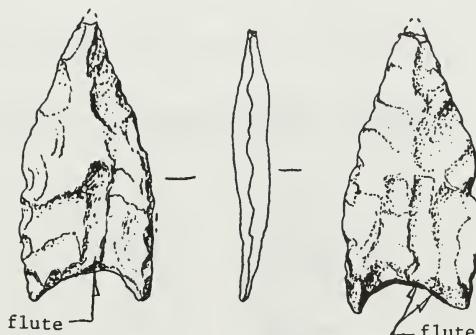
Lanceolate knife/point

Gray chert

Two fluted sides

FIGURE IX: 109

## Lake Mojave/Clovis



China Lake, Mammoth number 4

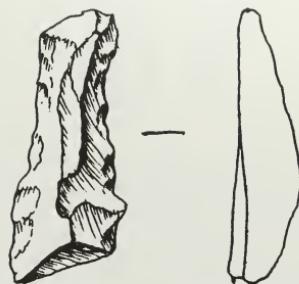
L-5.0 W-2.3 T-0.6

Knife/point

Obsidian

FIGURE IX: 110

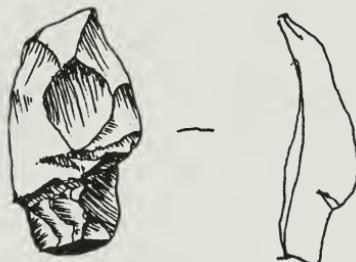
L->5.0      W-1.8      T-0.9



"Slug" scraper  
Heat-treated chalcedony

FIGURE IX: 111

## Lake Mojave / Clovis



China Lake, Transect B, Site 3  
Area M

L-4.3      W-2.3      T-0.]

FIGURE IX: 112

Unifacial cutter  
Curved  
Two shoulders  
Gray chert

China Lake, Transect B, Site 3

General Surface

L-3.7

W-1.9

T-0.7

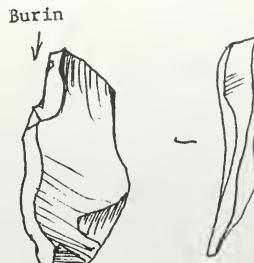
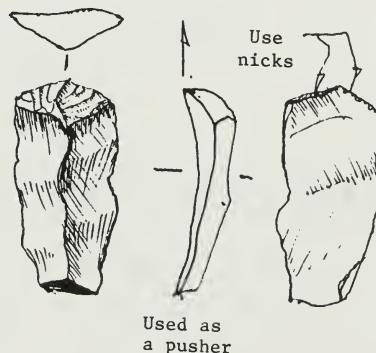


FIGURE IX: 113

White and tan banded chert  
True burins are rare in this collection

## Lake Mojave/Clovis

FIGURE IX: 114



China Lake, CRBR, Site Area #1

Surveyed

Quad A

L-3.8      W-1.8      T-0.6

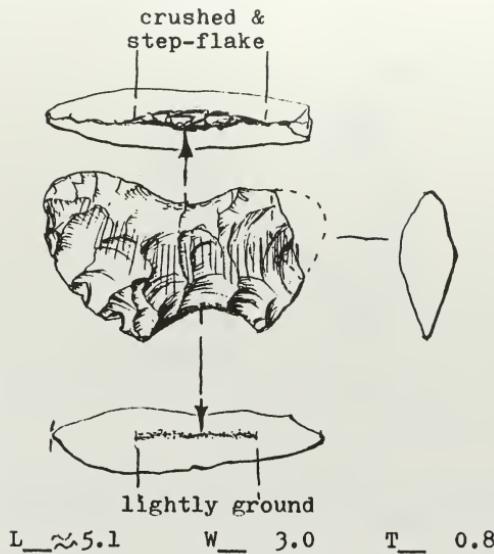
Rounded end scraper

Made on a blade

White chert

CHINA LAKE. Site area M-184 (Gen. Surf.)

Fagnant Collection



CRESCENT (CLASS III)  
Agate  
Reference: Tadlock 1966  
Amer. Antiq.

FIGURE IX: 115

## LAKE MOJAVE/CLOVIS



China Lake, Site Area M-184

FIGURE IX: 116

Fluting Cotradition

DOUBLE SPUR BEAK

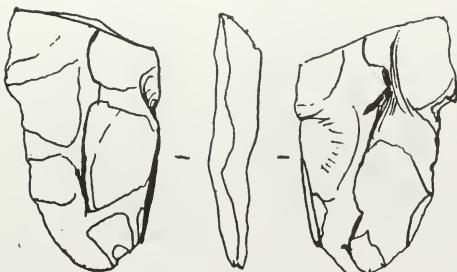
Chalcedony

L-3.3    W-2.4    T-0.6

Searles Lake Area, R46E,T28S

Pilot Knob Quadrangle

L- 5.0      W-2.7      T-0.8



Knife base

Pink rhyolite

## LAKE MOJAVE/CLOVIS

FIGURE IX: 117

China Lake/Transect B/Site 3 Section 2

L-3.4 W-3.3 T-1.5

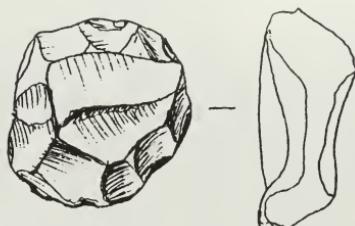
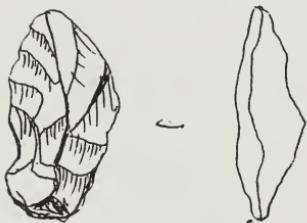


FIGURE IX: 118

Pink chalcedony "Biscuit scraper"

## Pinto 1

FIGURE IX: 119



China Lake Transect B, Site 3,

L-3.7 W-2.0 T-1.9

obsidian

Bifacial cutter, keeled-2 shouldered-1

China Lake/M-184/CRBR Uncontrolled Collection

L-4.4 W-2.4 T-1.3 F. 227

"Slug" scraper (The keeled scraper of Campbells)

Heat treated chalcedony, white with tan veins

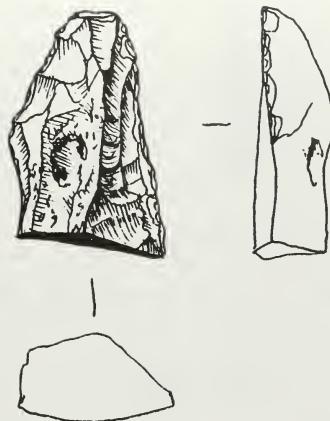


FIGURE IX: 120

## Pinto 1

China Lake/M-184/CRBR Uncontrolled Collection

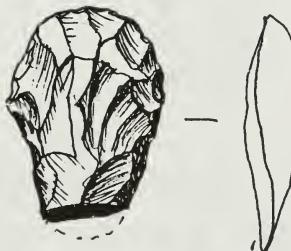
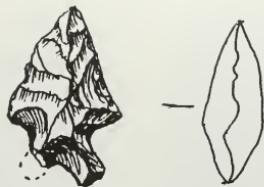


FIGURE IX: 121

L-4.1 W-2.2 T-0.8

Obsidian Rounded-end scraper



L-3.0 W-2.0 T-0.9 (thick) Obsidian Notched - 3

Small knife/point (or point/knife)

## Pinto 1

FIGURE IX: 122

China Lake/M-184/CRBR Uncontrolled collection

L-~4.0 W-2.3 T-0.7

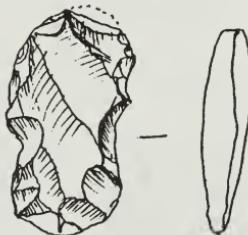


FIGURE IX: 123

Translucent, white agate Bifacial cutter/bunt

Stemmed Shouldered-2 Curved

This is a classic example of a cutter which  
would have been classified as a "point"!

China Lake/Transect B/Site 3 Section 4

L-3.9 W-3.4 T-1.3 Pink chalcedony

Biscuit scraper with multiple spur beaks

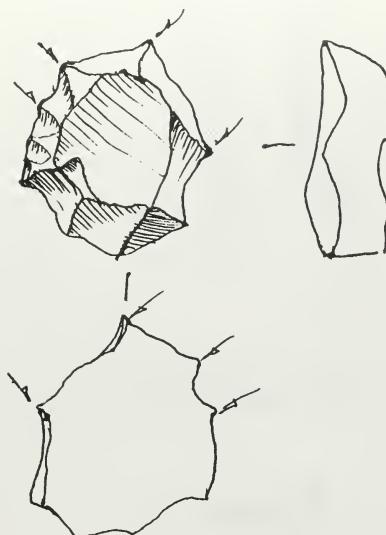


FIGURE IX: 124

## Pinto 1

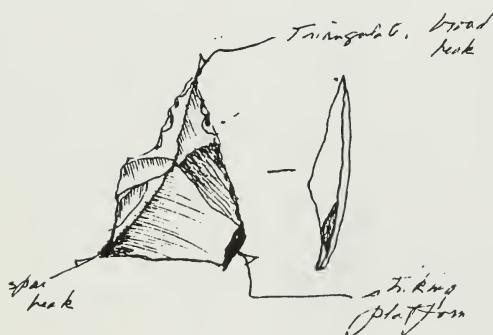


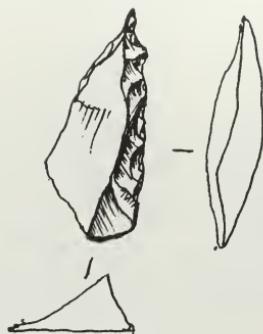
FIGURE IX: 125

China Lake/CRBR/Site area #1

Surveyed  Quad D

L-3.1 W-2.5 T-0.5 Pinto? D-3 Broad Beak- triangulate type

Made on a side-struck flake Sheep Springs Agate



L-3.9 W-1.6 T-0.8

Single spur beak Obsidian

FIGURE IX: 126

## Pinto 1

FIGURE IX: 127

China Lake Henry Site

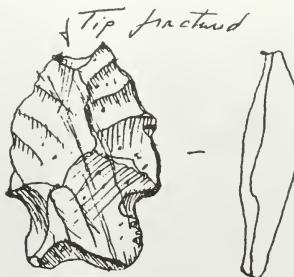
# A-13



L-2.5 W-1.5 T-0.8

Obsidian Flake with 2 spur beaks

China Lake/M-184/CRBR Uncontrolled Collection  
L-~4.0 W-2.6 T-0.8 Knife/point Rust banded  
rhyolite Stemmed Basal notch Shouldered 2

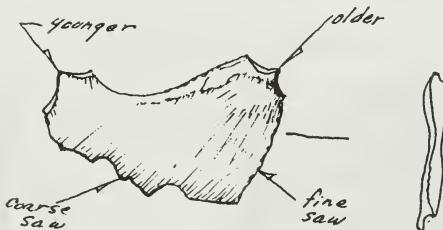


Note: a good example of a skilled knapper's ability to press even and long pressure flakes from rough material.

FIGURE IX: 128

## Pinto 1

FIGURE IX: 129



China Lake/Stake 19B L-4.4 W-2.6 T-0.5  
Crescentic Reddish (silicified tuff?)

compound work tool, probably a woman's

L-3.1 W-2.4 T-1.0

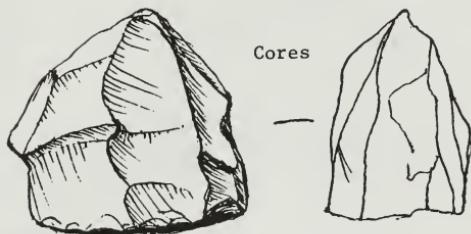


Crescentic with broad and spur beaks A woman's composite work tool. Clovis phase? Heat treated chalcedony, little sanding

FIGURE IX: 130

## Pinto 1

FIGURE IX: 131



L-4.0 W-4.0 T-2.7

Microblade (?) Core

White Chalcedony

c m

A



B

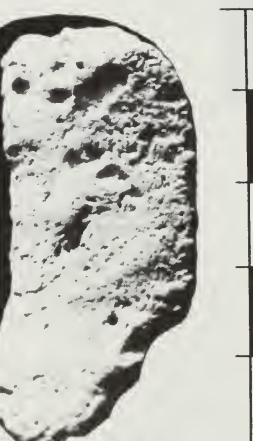
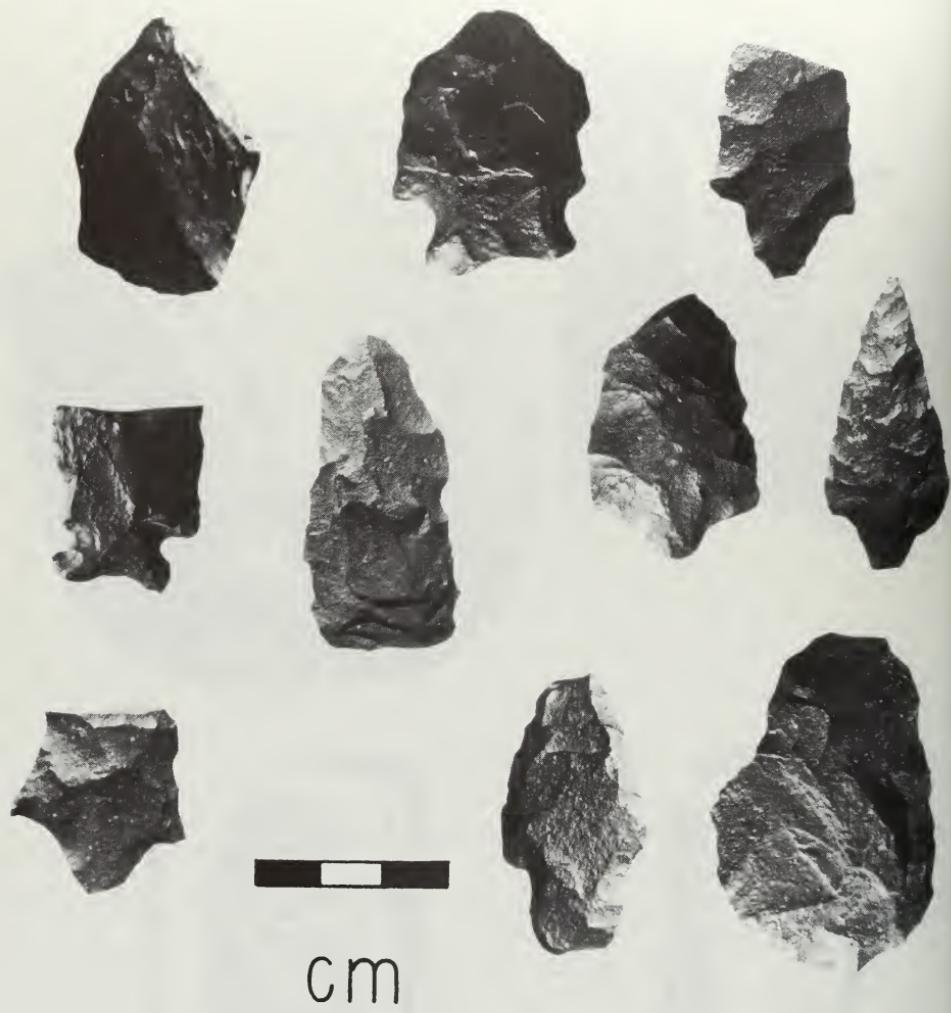


FIGURE IX:132



PANAMINT DUNES

FIGURE IX: 134



cm

PANAMINT  
DUNES

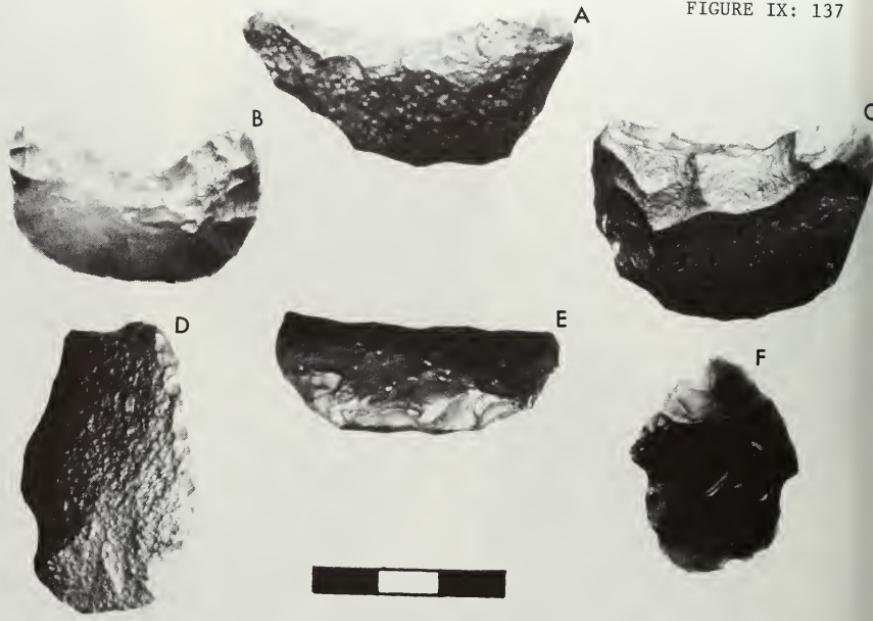


PANAMINT  
FAULT SCARP



LAKE HILL ISLAND

FIGURE IX: 137



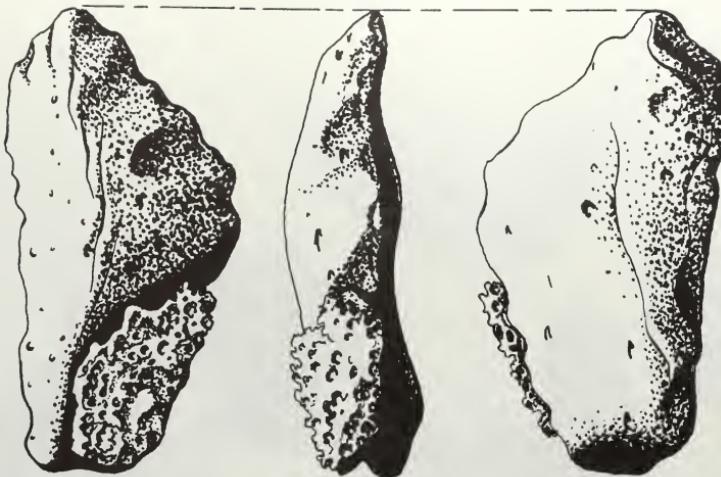
cm

LAKE HILL  
ISLAND

FIGURE IX: 138



HUNTER MOUNTAIN



364-145 Panamint Fault "K"



Scale: cm.



364-186 Zero Island Beach

Figure IX:139 Tufa incrusted macrolith objects  
from 1,800 foot level, Panamint fault.

ROCK COMMUNICATIONS AND CONFIGURATIONS



## PETROGLYPHS AND PICTOGRAPHS

E. L. Davis

Petroglyphs are pictorial messages that have been pecked or scratched onto the faces of boulders and cliffs. Pictographs are painted on the same kinds of surfaces using mineral earth and charcoal as colorants. Natural clay was probably the adhesive although animal fat or vegetable gum might have been used. Both forms of pictures are included under the familiar rubric of Rock Art (Figure X:1).

Rock arts are found all over the California mountains and deserts. Styles and subject matter are extremely varied. They are numerous: 211 localities with rock art are recorded on our CDCA Sensitivity Maps. These probably represent only a fraction of the rock art localities each of which may contain hundreds (or thousands) of individual pictures.

There is an extensive literature covering rock art: Mallery (1972); Turner (1979); Julian Steward (1929); Campbell Grant (1968, 1971); Heizer and Baumhoff (1962), to mention only a few of the writers on this subject.

Ages of rock art depictions probably span at least 11,000 years. There is a petroglyph boulder in Panamint Valley that is associated with the remains of a rock alignment. I assign the alignments in the area to a 500 year period between 10,000 and 10,500 B.P. when the lakeshore was used by PaleoIndians with a Lake Mojave Toolkit of stone implements.

A writer named La Van Martineau (1973) has written a



Figure X:1. Rock with petroglyphs at Little Lake (after Berryman and Berryman 1979, Figure 5).

book about rock art symbols that were developing in the direction of standardization and therefore of ideographic writing. This is both intriguing and reasonable. Everyone else took that direction sooner or later.

During numerous surveys at Little Lake and the lower gorge of Owens River (Davis, 1978c:25 and Fig. 18) I saw two glyphs with messages as clear as writing. One, at Little Lake, was an ellipse with a diagonal bar through it, beside the only natural stairway up a cliff. The message reads: "right here there is an access hole where you can climb up." I did.

The other one-to-one symbol is near Lower Fossil Falls. It is the figure of a man, upside down. This meant "he is dead" or "was killed," a representation that was also used, with the same meaning, in Mexico and Central America where cultures had advanced more rapidly in both the technologies and arts of civilization.

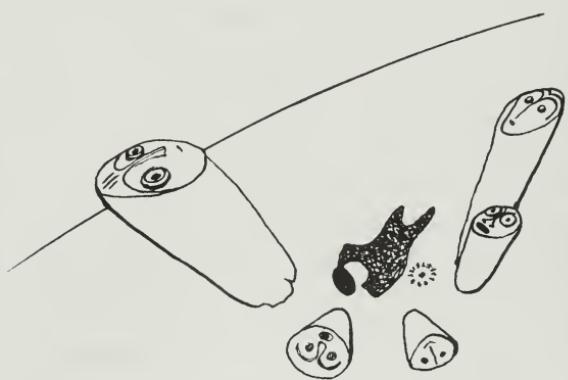
SHAMANISM, LITTLE STONE CIRCLES AND  
THE CALICO "HEARTH"

E. L. Davis

Seven hearth-like stone circles a meter or less in circumference have been excavated, or photographed on old pavements in California deserts. Two are probably early Wisconsinan or Sangamon in age. All are formed with at least two basic elements: a circle, and a central target of one to five stones. Two have wing-like appendages on opposite sides. I suggest that these patterned constructions were not functional cooking places but were important symbols of the World Centre (Eliade, 1961:57-85), sun and sky; also that they were ritually constructed near human habitations and were the products of Shamanistic ikonography characteristic of Paleolithic religions in Siberia, Dal'ny Vostok (The Soviet Far East), and North America.

Imagery, ritual and spiritual belief are hard to trace archeologically and yet their vestiges are undoubtedly present because Shamanism was ubiquitous in Paleolithic North America (Eliade, 1970:288-336) as it was in Siberia and the Soviet Far East (Dal'ny Vostok). I use Shamanism here in a general sense, to mean beliefs in the connection of humans with unknown powers, with the world of animals and with occult ties among the great natural forces--cast in the characterization of Beings. These beliefs were enacted in ritual, in drama and ikonography. The presentations were presided over by special persons (Shamans) who had transcended the barriers between Worlds of People and Worlds of Others, while in a state of trance. The mysteries of mortality and rebirth are symbolized in the Shaman who (while in a

FIGURE X: 2. Symbolic paraphernalia of a North East Asian Shaman.



trance) "dies." His/her bones are symbolically scattered then reassembled and regenerated. Bones attached to his belt are important elements of a Buryat or Chukchee Shaman's symbolic costume (Figure X:2).

Fifteen years of field observations lead me to think that traces of Shamanistic ikonography appear in various stone alignments, circles and ground figures of the California deserts. Further, I observe that a consistent (although inconspicuous) class of stone configurations--little circles with a centre or target--are ritually constructed imageries of the "World Centre" (Eliade, 1961:27-56). The small circles are also symbolic of the sun or the celestial universe of sky--perhaps the day. I propose that the so-called "hearth" deep in fan deposits at the Calico Site (Schuiling, 1979), is one of them (Figure X:3). I have recently inspected the Calico feature in Master Pit 2 at the site and also in a replica display at the San Bernardino County Museum. Although a fire once burned in it (Berger, 1979 b), it probably is an ikon not a cooking place. The column of smoke represented both Cosmic Centre and a ladder for the Shaman's ascent into Heaven.

Two other comparable features were recorded by our work parties from Westec Services of San Diego (Figures X:4 and 5). The circle shown in Figure X:4 is in the Yuha Desert about 5 kilometers north of the Mexico-United States border (Westec Services, Davis, 1979b:134). The second circle (Figure X:5) is within an extensive quarry-workshop area, south of the airstrip in Wingate Pass on U.S. Navy Mojave B Range (Manuscript in preparation).

A fourth stone circle was excavated in 1977 during a salvage investigation of the Mission Ridge Site, San Diego, prior to destruction of the site for a housing

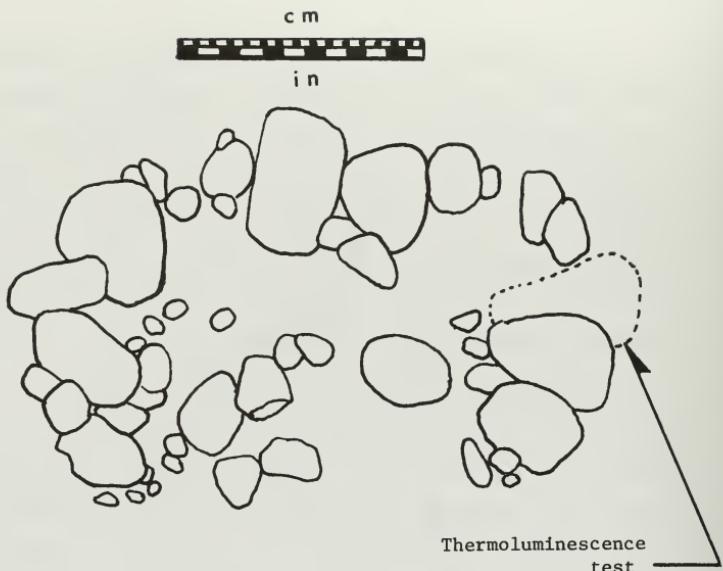


FIGURE X: 3. Fire circle at the Calico Site, 279 inches deep in Master Pit 2. Dotted outline at right shows position of a rock that was removed for thermoluminescence tests. The tests showed that the inward end of this rock had been heated to about 400° centigrade--six times as much as the outer end.

Photographed by Julia Craw. (Courtesy of the San Bernardino County Museum.)

project. The site was southwest of Friars Road on the west side of Rancho Mission Road. It is part of Lot 49, Rancho Mission of San Diego, City of San Diego (Map 1). Archeologically, the site was characterized by burned rock, an anvil stone, a hammer, retouched quartzite flakes, a (dubious) core and numerous quartzite fragments. Ninety-nine of the fragments were not water rolled while 230 had been rolled. Flakes that were catalogued were all of quartzite (the predominant country rock of this stream valley) but four sharp flakes were of felsite, a material frequently selected by San Dieguito knappers of a far later period at the Pleistocene/Holocene time boundary--12,000 to 8,000 B.P.

The Mission Ridge deposits are older than San Dieguito. The recorded stone specimens come from Level 3 "believed to have been a late Sangamon Interglacial soil deposited upon stream terrace gravels . . ." (unpublished manuscript, John Pohl, UCLA, 1977).

All of the (proposed) Shamanic circles discussed above are less than a meter in outside diameter, are formed of stones with the smaller ends oriented consistently in relation to a common center, and the central space is marked by a target of one to five smaller rocks. In the case of the Calico configuration, one of these central rocks is an artifact with two percussion flaked facets.

The Yuha Desert circle on West Mesa (Figure X:4), and also the Mojave B Range workshop circle (Figure X:5), both have sinuous tails extending from opposite sides, approximately north and south. Figure X:6 illustrates yet another sample of small circles with wings or tails. These two (possibly three) enclosures on Pinto Wash have a single appendage of rocks running off to the right. Note that there is a certain resemblance between these multiple

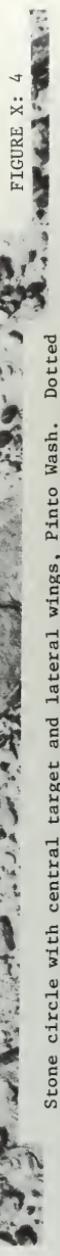


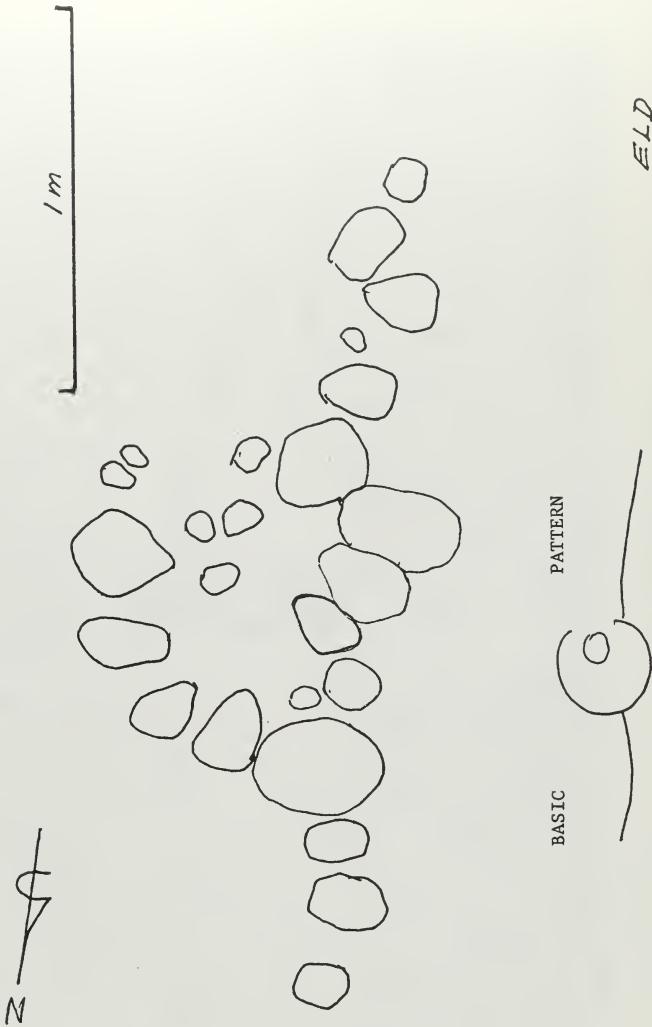
FIGURE X: 4

Stone circle with central target and lateral wings, Pinto Wash. Dotted lines mark bare spots where stones have recently been kicked out.

FIGURE X: 5.

A POSSIBLE CONFIGURATION OF ROCKS

Quarry-workshop area, U.S. Navy, Mojave B Range, Wingate Pass SBd Co. CA.



enclosed spaces and those in Panamint Valley, shown in Figure X:7.

I suggest that all four of these small circles are ikonographically similar and may be interpreted as follows:

- 1) They are World Centre/Sun images (the peripheral rocks are arranged like rays).
- 2) They were carefully constructed by special persons for ritual purposes (the image is repetitive and therefore part of a tradition).
- 3) They may have had small fires built in them to elaborate their symbolic meaning (light, heat, a ladder of smoke).
- 4) The use of fire is certain in connection with the Calico circle (Figure X:3) as confirmed by thermoluminescence tests (Berger, 1979b).

In the case of the Calico Site configuration, this interpretation reinforces acceptance of the circle as a humanly constructed feature. It is not convincing as a mere hearth--a place to cook--but acquires greater validity if understood in a broader context of ritual and symbolic magic. In the context of Shamanism--ritual control of nature by humans--the Calico specimen is reinforced by the comparable Yuha and Mojave B specimens, also the Mission Ridge and Panamint rings and thus becomes part of a widely distributed general phenomenon. This phenomenon is Paleolithic religion in North America. Broader interpretation also places Calico in a different order or probability since imageries of Shamanistic ritual appear in California in other desert ground figures such as The Three Great Serpents of Panamint (Davis and Winslow, 1965:Figure 2; Davis in this report).

Twin circles too small for dwelling.  
Pinto Wash

FIGURE X: 6



Theoretical Implications of  
This Proposal

The theory outlined in this report is highly speculative. However, it possesses both parsimony and functionality in that it allows for polarization of previously heterogeneous information into a productive model. This model transposes ground figures--small circles in particular and the huge "ground drawings" in general--out of a class of mere noise and places them in an important ikonographic slot. If treated as special motifs in a large framework of Paleolithic Shamanism, the circles and serpent motifs (which were previously invisible) can be "read" by extrapolation and thereby achieve a high degree of visibility in our understanding of desert paleo-cultures.

One of the most interesting results of this noise-to-image transposition is the sense of character and time depth it lends to our view of the antiquity of New World religious beliefs. As an example, the Calico Site stone circle is at a depth of 16 m in a geological formation that is 80,000 to 125,000 years in age. The Mojave B feature cannot be appraised for age. The quarry material composing it is only slightly weathered. The Yuha Desert feature is a better candidate for antiquity: the stones that compose it are heavily weathered and crumbling, the pavement that supports it is on a water-abandoned interfluve and a heavily weathered Macro-Levallois cap (Davis, Carter, Minshall and Hardaker, this report) was found nearby.

The proposition that both some ground figures and identifiable religious traditions have roots in the Pleistocene that are 80,000 years or more in age supports (although it does not confirm) my view that enough evidence exists to suggest an early Wisconsinan or Sangamonian antiquity for

some California cultural activities. This possibility should be accepted as a challenge to look more energetically for verifiable information about early human manifestations in the California deserts and to reconsider their actual dates--radiometric or other.

To be sure, the interpretations suggested above are hypothetical. They push data to the limit. At this point in history it is necessary to push strenuously in order to break an ice block. California desert archeology offers some of the most intriguing opportunities for verifiable time-depth studies in the New World yet it is stuck on bottom dead center. People are afraid of it yet novel possibilities are here. The enigmas of antiquity cannot be cracked without dedication and enormous effort. Leakey worked for thirty years to establish Olduvai; Schoetensack in Germany waited for decades to find the Mauer jaw; du Bois was equally persistent in hunting for the Trinil remains. I have personally photographed Yuha Desert artifacts of Paleolithic pattern, choppers, scrapers and chopping tools, that had been exposed by floods in the wall of Pinto Wash more than 20 inches below surface. Bold speculation by Childers and Minshall was required to recognize these tools. The same kind of thinking has been used to recognize and explain seven modest stone circles and to place them in a context that represents a very long New World cultural continuity. This is exciting, particularly because of the insight provided into the Paleolithic roots of New World religion and some of its ikonographic elements.

Recognizing repetitive, basic patterns of human thought in archeological evidence is a step in breaking the invisible wall raised against recognition of psychic imagery. Figure X:5, bottom, shows a basic pattern of some of the small stone circles that appear in California deserts: it is a

symbol, an archetype of the World Centre and of the appropriate alignment of humanity within this configuration.

Figure X:7 is, I think, loaded with significance. It needs to be separated into its elements and motifs for decoding. This implies field work and preservation. This slide was taken in 1962 when I was in graduate school and knew virtually nothing about either California deserts or the ikonographies of the former inhabitants. When I took this picture I noted "two house rings or sleeping circles" and was unable to perceive that within the configurations are (perhaps) a phallic rock (arrow at left center); various interior marker stones; a small circle or spiral with central target (arrow at lower right); an unusual amount of new-looking, medium-size rocks at bottom center. All these are elements and are part of the encoding. In order to make an element separation, the whole group should be photographed from about 50 feet aloft using a tethered balloon as a camera platform. A number of imageries should be used: black and white, color, false color and infra-red. I believe the arrangements will resolve into communications.

This group is in South Panamint Valley. It is impossible to over-emphasize the importance of preserving many areas in Panamint which should not be opened for destruction until all of its fragile record has at least been recorded by aerial photography and mapping. I suggest that the boundaries of Death Valley National Monument should be extended westward to include parts of Panamint Valley.

#### Summary

Probably these circles are all Hearth-Images rather than places to cook. They appear to be symbolic rather than utilitarian for the following reasons: 1) they are the wrong

FIGURE X: 7 I suggest that these circles with central targets (eyes) are meaningful inscriptions rather than a place to lie down.



size; about 0.5 - 0.75 m, too large for a cooking fire of twigs and too small to be a high-visibility bonfire. 2) They have a consistency both across space and over time reckoned in terms of thousands of years that suggests an ikonographic meaning as compelling as was the cross to Medieval Europe. 3) A two-foot perimeter of stones is unnecessary for a camp-fire; a small hollow is better.

I have experimented with a useful, provocative explanation of this symbol. For too long we have gotten nowhere by striving to force the "wet," fluid interdiscipline of archeology into rigid molds of "freeze-dried" science. It is like trying to put an oyster into a slot machine and I suggest we change our systems of thought. An archeologist should be as quick to recognize archetypes as to note peat deposits. The fabulous cultural wealth of the desert biome is that it is also a psychic-materialistic ecotone.

THE THREE GREAT SERPENTS: A MYSTERY STORY

E. L. Davis

The most beautiful and most profound emotion one can experience is the sensation of the mystical. It is the source of all true science.

Albert Einstein

Scattered across the California deserts are some of the largest works of religious art in the world--giant ground figures, laid out in rows of rocks or scraped into the reddish brown gravels. A surveyor comes upon one of them suddenly. Like walking up on a rattlesnake, there it is, under your feet. The figures may be found any place where a pavement surface has always been undisturbed, protected from water erosion by some natural obstacle: a cliff, a gully or a fault scarp. The shaman artists who designed the figures knew how to choose stable and enduring backgrounds for the collective works they supervised. Some of the dark volcanic pavements that support these collective presentations must be scores of thousands of years old, although the figures are younger. The sacred messages remain untouched, swept clean by the wind, soaked in winter, baked in summer.

The older (more weathered) figures (rock alignments) seem to be preoccupied with water or messages about water. Snakes and snake surrogates--zig-zags--are common. The more recent gravel effigies (created by clearing away dark brown pavements to expose a pale silt that underlies them) express a concern with human or biotic organization. These figures may reflect the impact of European intrusion. The two, radically different problems (drought on one hand, invasion on

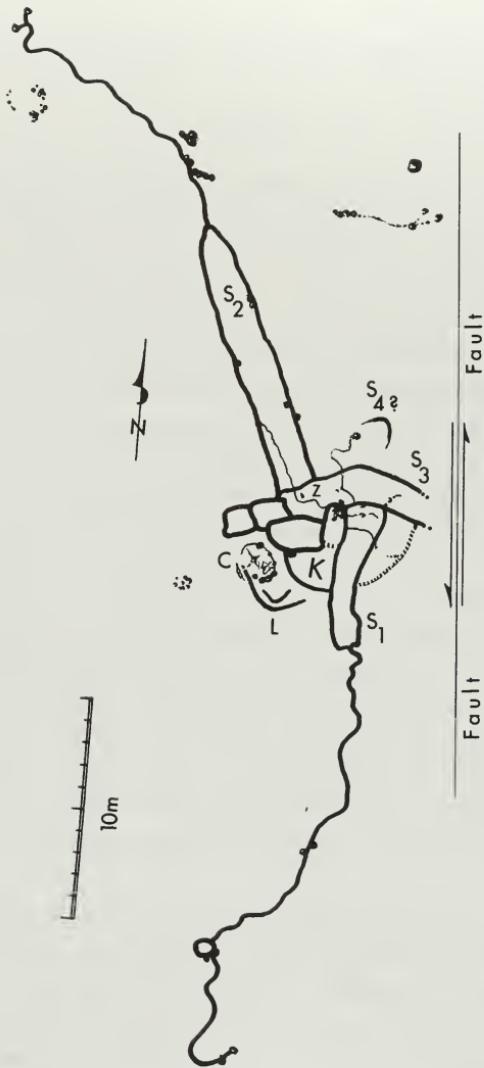


FIGURE X: 8

the other) may be our best clues to the age of the two art forms.

The configurations are very large and measure from two or three meters to scores of meters in size. Composed of surface materials only, they are among the most fragile of prehistoric records. They are highly visible and have therefore become targets and slalom gates for bikers and ORVs. It is questionable if any can survive the next hundred years of increasing use/wastage of the deserts.

Ground figures of the California Deserts have been divided by Davis and Winslow (1965) into two general classes: rock alignments and gravel effigies. The configuration discussed below is a rock alignment. In a single afternoon, a party of bikers can wipe out a whole figure--and they seem to take pleasure in doing so. Immediate, complete photographic recording and componential analysis of the entire corpus of desert ground figures (there are dozens of them) is the only way they can be preserved. It is essential that a special project be established for a complete ground-and-air study of all California Desert ground figures together with alternative interpretations of their psychological meanings and social functions. Something can doubtless be learned of both the purpose, the ikonography and the associations of ground art by using the Nazca (?) Ground Figures of Peru as points of ideological comparison. More will be deduced from Southwestern shamanism, Hopi and Zuni ikonography.

Vertical aerial photographs show that a previously published Mojave Desert ground figure (Davis and Winslow, 1965 : Figs. 2 and 4) is a legible work of sacred art. I call this the Three Great Serpents (Figure X:8). By using information from three kinds of imageries the meaningful components of

FIGURE X: 9. Aztec rain deity, Tlaloc, with a serpent face.



the effigy can be decoded. The imagery systems are ground photographs and aerial photographs on one hand; ikonography on the other. The ikons fall into three overlapping classes: symbols of the problem elements that cause a ceremony to be performed; symbols of the sacred actors whose help was invoked; symbols of the cosmic centre and the means by which the Shaman could ascend from this centre to a Celestial World in search of aid.

Serpents are a most striking and legible design element of the ground drawing shown in Figure X:8.

The serpent in the New World has both fertility and water associations with a greater emphasis on water (Mundkur, 1976:438). Figure X:9 reproduces (after Mundkur, Fig. 11), a sculpture of the Aztec rain deity, Tlaloc, with a face composed of two twined serpents. In the New World, there is also a link with the life-giving and all-powerful Sun. This latter association is illustrated by a snake petroglyph at the astronomical site called Fajada Butte in Chaco Canyon (Frazier, 1979:61; Sofaer, *et al.*, 1979:283-291) recently published in Science and Science 80. A partially coiled snake, pecked into a southward facing sandstone cliff is stabbed by a vertical sun dagger of light at noon of the spring equinox and summer solstice at Fajada Butte.

The Great Serpents of our desert valley present a fascinating intellectual challenge: to mold the tools and methodologies of conscious and unconscious lateralities of the human mind. On one hand, we work with laboratory numbers; on the other hand, with ikonography and psychically generated images. In a curious manner, they fit neatly if one glances from side to side between them. The effect is a non-linear, three-dimensional impressionism as follows.

The rock alignments described in this study are near Death Valley. They probably coincide with a final phase of a Lake Mojave/Clovis cultural stage about 10,000 - 10,500 years ago. The lakes were drying, forests and vegetation were retreating.

Bracketing  $^{14}\text{C}$  dates of 10,000 to 10,500 years B.P. from associated camps places the effigy in a geological/climatic framework of time. This time was on the critical Pleistocene/Holocene boundary when water budgets were diminishing and the Lakes Country (Davis, 1978c) with its productive marshes was becoming a desert. The PaleoIndian campers at Site INY-20 knew this. They invoked powerful resources of magic to restore their vanishing resource. Their guides in this collective work were probably Shamans: persons with long training and dedication in the use of symbolic tools, like the three major elements of this particular configuration: the Serpent, the Knot and the World Centre or altar. The Three Serpents invoke water from different celestial and psychic directions (Figures X:10, 11 and 12). The Panamint Condor (Figures X:11 and 12) (Clements, 1956:187) is the messenger who bears the invocation heavenward. Another bearer of wish-fulfillment messages could have been the Shaman in person who, impersonating collective psychic powers of the group, enacted an ascent of a vertical column of smoke from a symbolic hearth-circle.

#### A Bundle of Straw

Beneath the lintel of a Japanese temple hangs a spiral bundle of straw. This fragile barrier marks a dividing line between two states of consciousness--the sacred world and the ordinary world. The image has symbolic counterparts in the Mojave Desert. On a stretch of smooth desert pavement, spidery lines of rocks likewise divide two worlds--the ordinary desert surroundings on one hand; a sacred world of myth

FIGURE X: 10



Who were the people? They point to themselves with the major serpent.  
It points exactly at the buried Lake Mojave site.

FIGURE X: 11 Death Valley system. These rocks outline the wings and head of a bird—possibly a condor. Symbolically, birds were messengers to worlds above.



and symbolism on the other. Huge imageries, created by Paleo-Indians, spread across a level space associated with a recent fault scarp that has cut off part of the configuration. During the symbolically active life of this space, pathways and representations were outlined in rock traceries (Figure X:11). The alignments were sacred effigies, designed to control adverse natural forces that withheld water; to manipulate the gifts of waters from the earth by magically powerful myth, symbol, and ritual. Ceremony was, and is, a means of bringing the two worlds into alignment with one another. Interpenetration of the two psychic worlds ("A Cartography of the Ecstatic and Meditative States") was discussed in Science by Fischer (1971:897-904) and illustrated in his Figure 2 as common features of waking visions and sleeping dreams. I suggest that desert ground figures can only be understood as ceremonial paraphernalia of ancient, Shamanistic religions, ". . . archaic techniques of ecstasy" (Eliade, 1970).

If "it takes a thief to catch a thief," I have no doubt that it takes a Shaman to follow a Shaman, and like psychologist Fischer (1971:987) I shall volunteer as your tour-guide for a trip through the meaning and ancient history of a piece of desert art. This trip is not only for the Devout or for the neophyte of Shamanic religion. Tickets are available to all who are willing to set out in a direction that is epistemologically different--"gnostic" rather than mechanistic (Figure X:13).

"I have carefully defined 'gnosis' in my writing as a kind of knowledge other than scientific knowledge--a knowledge that is augmentative rather than reductive, that honors and invites the aesthetic, sensuous, compassionate, and visionary possibilities of experience as well as the rational and technical" (Roszak, 1975:791-92).

Recognition is a curious phenomenon. For years I "looked" at an aerial photograph of this rock alignment but never "saw" the snakes or the other design elements with which they were associated. Psychological readiness is a major part of the process of recognizing. The vertical photograph, clear as a line drawing, had always been meaningless. Suddenly, triggered from within, it popped into sense the way a slide in a projector can pop into focus as the transparency warms. First I saw the long tongues, then two snakes, then snake number three, decapitated by a fault scarp.

At this point, interpretation took a long rest. I read books, poured over Shamanistic paraphernalia in the museums of Irkutsk and Khabarovsk, talked intensely--endlessly--with a friend who was turned on by Shamanism. For a time I became his pupil and acolyte.

Then the effort of translating the rock lines into this written form enforced a period of long absorption (with additional reading). One after another new elements of the configuration began to develop like words of the secret code in Edgar Allan Poe's mystery story "The Gold Bug." Finally, a point was reached at which a natural maximum of new ideas had emerged and attached themselves together with hooks and eyes of association. The last, least expected, and most gratifying realization incorporated solid archeological information (peat sequences, radiometric dates, the exact location of a camp we had excavated) into patterns that were woven from a tissue of Shamanistic elements. Extraordinary!

#### Desert Shamanism: The Means of Deciphering Ground Arts

Ground figures or ground drawings (like the Nazca drawings in South America) are widely distributed in California



SCALE: FEET



FIGURE X: 12. Viewed from slightly above the condor has this appearance. Vertical pictures from at least 50 feet aloft are needed.

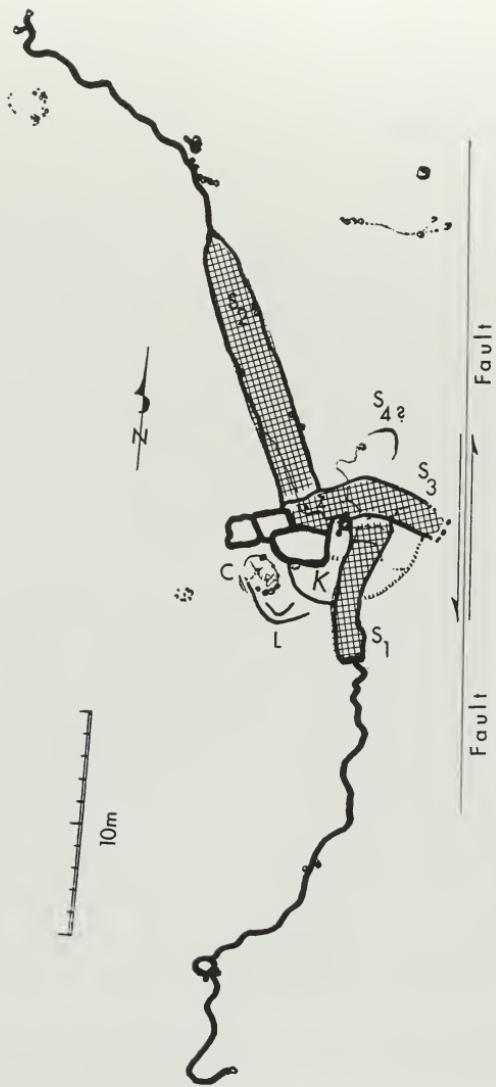


FIGURE X: 13. Separation #1, the Three Serpents.

deserts (Clements, 1956; Davis and Winslow, 1965; Harner, 1953; Hunt, 1960; Von Werlhoff, written communication, 1979; Wallace, 1958). The ikonography and function of the huge effigies (some of which are more than 100 meters in length) have remained enigmatic until Von Werlhoff recently suggested that the scraped gravel effigies found near the Chocolate Mountains in Southern California were probably regarded as spirit beings and may have served as guardians or protectors of the regional inhabitants. Pursuing further the idea of ritual use of ground figures, I shall discuss the Three Great Serpents effigy in a desert valley. This configuration is viewed from the ground in Figure X:10 and from the air in Figure X:8. I suggest that these three snakes, outlined in rocks on a desolate bench above a dry lake, are powerful religious symbols from California's prehistoric ages. Made by PaleoIndians, they were probably collective creations, community efforts like construction of the great Gothic cathedrals in Europe. They are, however, far older and reflect more ancient beliefs and imageries. Serpents have connections with arcane and powerful, interlocking symbols: Water (discussed above), Earth (snakes disappear into holes), Sex (phallic imagery) and Lightning (snakes zig and zag and flash out of sight). Lightning in turn implies water, rain and fertility. Snakes--as helpers --are a part of some Asian shamanic costumes (Eliade, 1970: 152; 1961:173). See also Figure X:2, a Siberian Shaman.

The Three Serpents fit the ikonography of a Paleolithic religion shaped by gatherers and animal hunters, while gothic Christianity was a different religious system based on agriculture and animal husbandry: on real control of nature by manipulation rather than magical control by symbolic fusion.

Paleolithic religion was shamanistic and serpents were elements of North American and Siberian Shamanism and

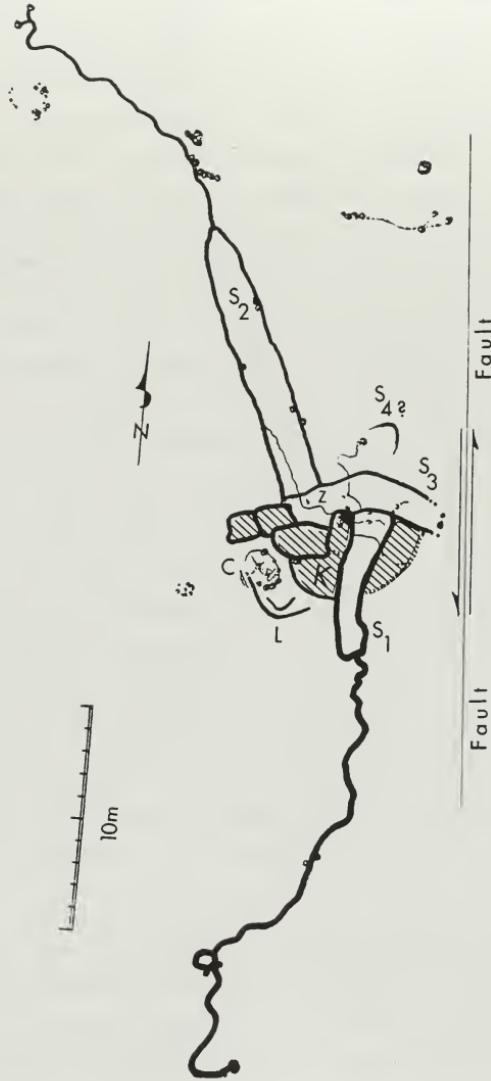


FIGURE X: 14. Separation # 2, the coils or knot.

ikonography. The famous Hopi snake dance is a surviving illustration. This system of beliefs is a cosmic interpretation in which human, natural and supernatural worlds interweave. Humans can achieve magical connections with unknown powers: the worlds of serpents, birds, fish, animals; and with occult ties among great natural forces that are cast in characterizations of Beings. These interwoven beliefs were enacted in ritual, in drama and magical imageries. The presentations were directed by special persons (Shamans), men or women who had visions, passed into trances and altered states of consciousness in which they transcended the barriers between Worlds of People and Other Worlds. Mysteries of mortality and rebirth are symbolized in the Shaman who "dies" in a transformed state. His/her bones are scattered, then reassembled and regenerated. A Siberian Shaman's belt fringe of bones shown in the illustration by Pavlishine (in Nagishkin, 1977:opposite p. 26) symbolized this imagery. It is an archetype. (See also Figure X:2, this section). In different forms it recurs around the world in many religions including Mithraism, Christianity, Zoroastrianism and the beliefs of Egypt. The burial of Shanidar IV with flowers under his head probably reflects an even more ancient, Mousterian, involvement with the same cycle of death and new florescence. Again, the serpent enters the picture because serpents emerge each year from their dead skins. The Three Great Serpents belong in a pan-human realm of thinking--myth, art and symbolism.

In order to see into the contents and also the context of a ground figure, one must have both ground-level and aerial photographs for prolonged study. Several kinds of emulsion or film--color, infra-red and black/white--would also be desirable. Each film "sees" a different chromatic reality within the radiation spectrum. Ground vs. aerial

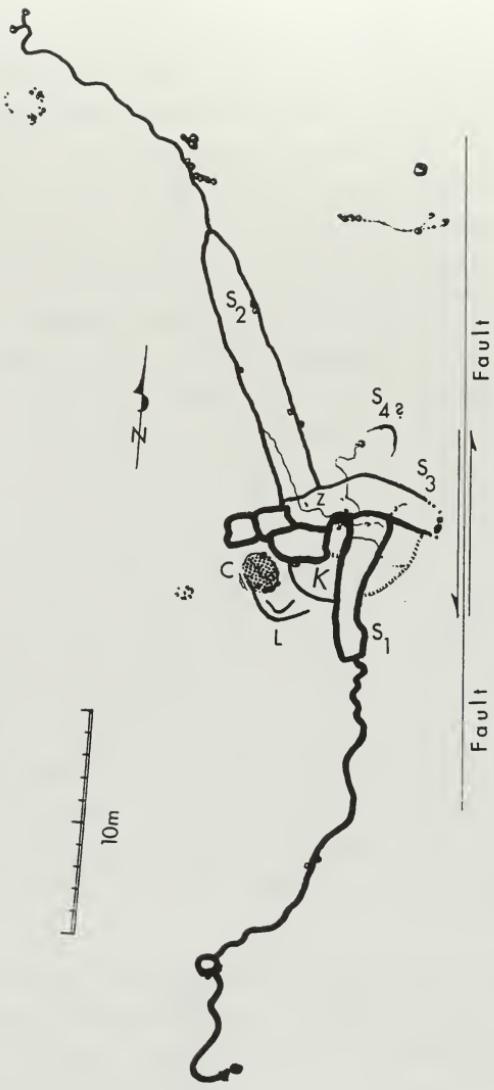


FIGURE X: 15. Separation # 3, Center of the World with super-imposed altars.

views add a different sort of dimension--perspective within a landscape and relationship within the figure and its immediate background. Figure X:10 shows that the entire configuration, except for the tongue of the longest snake, was designed to fit within an unusually clear surface of water-sorted pavement, free of larger rocks so that the artificial lines stand out dramatically. The more distant surface, beginning just before the Jeep, is scattered with basalt boulders that give a darker, more broken-up appearance, a less desirable background. This selection of a smooth background indicates a high degree of knowledge and esthetic judgment. The shaman was a geo-artist. The perspective afforded by this photograph also shows that the longest snake points past the Jeep exactly toward a beach on the far side of the small hill, where a Lake Mojave campground is buried. Figure X:8 shows the relation of the whole ground figure to a fault scarp and the internal relationships of components that make up the complex design. The fault lineament is marked along the lower side of the picture. It tells us two things. First, the most recent uplift/displacement along this fault took place after the last snakes were constructed, because one of them was decapitated by the new scarp. Second, the escarpment has a functional relation to the figure. The embankment diverts floodwaters from above thus preserving the work of art from erosional destruction. It is therefore reasonable to assume that an older fault scarp was present at the time the serpents were made and that this previous scarp served the same purpose but was a little farther away from the central imagery and allowed space enough for completion of serpent #3 ( $S_3$ ) including a long tongue. Figure 4 in Davis and Winslow (1965) is an on-foot sketch of the figure as we attempted to decode it in the early 1960's. We could not distinguish  $S_3$  at all until the USN Miramar photo recon squadron took an overhead shot, ten years later.

Photography does the same thing for the archeologist as for the astronomer, by providing a permanent, unalterable view. An image is fixed on a timeless emulsion, free of dust, twinkle, wind or human perturbation. This image can be studied and absorbed repeatedly by any number of observers.

To continue with the ground figure and its constituent parts as the aerial camera caught it--there is much more than one can see while standing on the ground. It is made up of three ikonographic motifs each of which in turn is made up of several elements. The motifs (second order of analysis) are (a) serpent; (b) knot; (c) cosmic circle or hearth. These can be further broken down into elements (first order of analysis or basic units) as follows:

body

Serpent: head              See Figure X:13  
                tongue

overlaps

Knot: coils              See Figure X:14

circle

Hearth:              See Figure X:15  
                centre or target

By subdividing the design plexus in this manner it can be approached for comparative purposes as pottery designs are approached and can be structurally analyzed. (Refer back to Figure X:8.)

The whole configuration is probably a palimpsest, a number of separate inscriptions, partial erasures and overprints. The logic for this proposal is first that a number of lines

are present that either are very dim (like "Z"), interrupted (like " $S_4$ ") or represent a long conceptual jump (like "C"). Let me explain. Z is a series of irrelevant lines like bits of noise from a previous graphic statement.  $S_4$  is isolated, unresolved--like a left-over piece of a rock outline that was cannibalized to create new outlines (possibly of  $S_3$ ). C looks like an afterthought. It occupies a space where graphic logic (drawing is extremely logical) as well as ethnographic logic tells us there should be a fourth serpent. Since the three snakes roughly follow compass headings, there should be a fourth one--a Snake of the West--in the picture. Also, four is a common sacred number in Western Native American traditions. Was this serpent originally constructed and then dismantled? Two concentric, but dissociated loops (L) suggest that this might have been its history.

C is spatially a part of L. However, it may possibly be an afterthought that is conceptually unrelated. C is an oval that seems to contain two star-shaped targets the larger of which is superimposed on the smaller. We must return and examine all these details on the ground again, to be sure C is ikonographically quite different from the serpents and the knot (K) as I shall later explain.

K is a coil motif, one of the units in a knot aggregate that is central to the whole configuration and from which the serpent bodies  $S_1$ ,  $S_2$  and  $S_3$  emerge.  $S_4$  and C/L are esthetically related although spatially detached.

This completes an enumeration of the design members of what I propose to be a sacred palimpsest--a number of overprints that were parts of the staging of shamanistic rituals enacted on the same consecrated spot but at different times. Continuing to work only with the information at hand, on

paper, the ground figure can be tentatively interpreted. A sketch was made on the site in 1962. It lacks many details ( $S_3$ ,  $S_4$ , C/L and most of Z) but shows two ikonographically important features: the tongues of  $S_1$  and  $S_2$  snakes continue long distances in stream-like meanders.  $S_1$  tongue is about as long as the entire remainder of the ikon and includes a small, realistic pond, tangential to a meander.

A final and crucial part of this descriptive preamble is the directional orientation and also the emphatic length of Serpent sub. one. It points straight at a Lake Mojave Phase campsite. A lake margin at one side of this camp has a date of  $10,520 \pm 100$  B.P. (UCLA-990). The material used for a date was charcoal from the stems of burned reeds. Only dried reeds in a dessicated marsh will burn. This drying trend in the climate was probably a focus of the religious energies of people who used the area. They had the misfortune of living at a time of major climatic changes--the critical, Pleistocene/Holocene boundary between 11,000 and 8,000 B.P. (before present).

I venture to reconstruct the history of the sacred configuration and the symbolic meaning of its parts as follows. Time: the various overprints may have spanned a period of as much as 500 years, beginning 10,500 years ago when a severe interval of dessication gave warning, and continued until 10,000 years ago when the lake returned, briefly. During this time span there are stratigraphic records of three bog episodes of diminishing intensity, sandwiched between intervals of dessication (Figure X:16). The supporting environment was becoming ephemeral, causing great concern to the Lake Mojave Culture people, who responded energetically through their shamanistic religion. The first interval of severe dessication has dried the marshes and made their supportive plant communities into tinder. A three

Reddish natrargid

Holocene drought

Organic mats A, B, C



FIGURE X: 16. Wall of stratigraphic trench at site INY-19, Lake Hill, Panamint. Three organic mats (bottom) represent three terminal Pleistocene marshes.

thousand year cycle of warming and drying climate (after eleven thousand years ago) had dramatic effects all over the Southwest including California Deserts (Van Devender, 1979). Patterns of rainfall changed, forest borders retreated up-slope, lake basins became salt pans and, by 8,000 years B.P., contemporary climate became established in the Lakes Country (Davis, 1978c). For the people who made the Great Serpents, this catastrophe brought to a close their pleistocene pattern of lakeshore life, a Pluvial Lakes Tradition (Bedwell, 1973; Hester, 1973) that had enabled Ancient Californians to exploit marsh and lake resources.

In the north valley of Lake Panamint, a radiocarbon date of  $10,020 \pm 120$  B.P. (UCLA 989), a peat from a final bog deposit, probably marks the last use of the valley floor by people who had depended on the lake for their subsistence. Lakeshore PaleoIndians were, indeed, People of the Marshes. With retreat of the forests, their Shamans lost the battle, symbolically and actually. Like the tree line, people retreated to higher canyons and upland valleys. During this prolonged struggle with adversity, the marsh people revisited the Ground Figure Sanctuary a number of times and their Shamans worked out an eloquent symbolic menage as follows.

Ikonography: the symbolic elements present are  
(a) serpents; (b) directionality; (c) knot; (d) an ellipsoid or circle; (e) two possible centres within the circle.  
(a) serpents are important and also ambivalent in myth and dream sense. They belong to the earth and her chthonic spirits; they belong to water. They can be malevolent. They can also be powerful helpers--snakes, represented by ribbons and handkerchiefs, figured extensively in Buryat and Altaic shamanic costumes of northern Asia (Eliade, 1970:145ff). They are still adjuncts in Hopi symbolism. They were adjuncts of the Aztec rain god, Tlaloc (Figure X:9). In the

Panamint context they should be read as helpers, representative of the water that was desired. (a) the snakes' long tongues, like rivulets, express this graphically; (b) directionality is clear and is also an element of wish fulfillment (again the need for water) since the strongest serpent points straight at camp: Site INY-20; (c) knots or ties may be desirable or restrictive depending on the nature of the bond. Here the knot can be read as a confusion of evil circumstances that have "tied up" life-giving waters. The Shamans who designed the final scenarios created a powerful magic by making the water serpents issue freely in three directions. The largest snake in particular--the one pointed toward the lakebed and camp--has escaped a long distance from a restriction laid down at right angles across its trajectory.

The C/L elements represent entirely different ikons with a different ceremonial purpose. Here there is possibly a representation of the cosmic circle, the world-hearth with its centre. Both a geophysicist, another archeologist, and I independently perceived this configuration as an "altar". It evidently speaks for itself. These appear to have been two such targets, one partly obliterated and therefore earlier. The archetype is the Centre of the Universe. It can be represented by a ladder, a tree that the Shaman climbs, the central house post. A vertical column of smoke rising in still air from a small, ceremonial hearth can also provide the Shaman with a straight ascent to Heaven. (Jack's beanstalk in European mythology is another such heavenly ladder). The California deserts have numerous little circles like this one, with a central target of one or a few rocks, described at greater length in the previous subsection. The most intriguing example of a symbolic centre is in Master Pit 2 in the Calico excavations near Barstow, California. At a depth of 7.15, below the present surface is a small

rock circle with a central target of rocks one of which is an artifact. Tests of a rock from the outer circle around this target showed that one end of the stone (but not the other) had been heated to a temperature of approximately 400 degrees Centigrade (Berger, 1979:33). The hearth lies in a part of the geological section that is 80,000 to 125,000 years in age. Ceremonial hearths must therefore represent a very old desert tradition, older by far than the 10,000 year age Serpents figure altar.

The snakes, knot and circle probably played different ceremonial roles. The escaping snakes and their restrictive knot represent the wish, the need of the people. The circles and targets were staging for the effective part of the ceremony: invocation of the sky Beings and the Shaman's ascent in person to enter Heaven as an emissary of the people.

#### Summary

The PaleoIndian inhabitants of a Mojave desert valley made use of powerful images to invoke or coerce natural and celestial beings who controlled water, plants, birds and animals. The serpent, the knot, the cosmic circle, the magical centre (Eliade, 1961:27ff) and the concept of ascent to heaven symbolized in a smoke column were evidently parts of their ikonography.

The wet/dry/wet stratigraphic record of the lakeshore, ikonographic preoccupation with water and the scanty overprints of rock tracery all reinforce one another in creating a single message about the prehistory of the local Pleistocene/Holocene boundary phase. The people were few. They only visited the area when conditions were favorable. Favorable environments were becoming increasingly infrequent after 11,000 years ago. This change is massively documented in

the South West's pollen records reported by Van Devender (1979), and by peat sequences in our 1965 bulldozer trench (Davis, 1970). Impact on little bands of hunter/gatherers was severe. Equipped with shamanistic religions that were rich in archetypal symbols of human/supernatural worlds, they strove to reinforce their own precarious position with these greater powers through ritual, pictorial art and drama.

The Three Serpents ground figure is an example of Paleolithic ceremony. It is as sacred as Westminster Abbey and as complex as Stonehenge. It is equally in need of respectful study and preservation. The ground figures are among the few presentations still remaining to us from Paleolithic religions of North America. They have much to tell us of the beliefs and practices of Ancient Californians (Davis, 1978c). To cite from Eliade (1961:174):

Starting from any stylistically and historically conditioned creation of the spirit one can regain the vision of the archetype . . . . The Images provide "openings" into a trans-historical world.

Despite their unique cultural value, the fragile ground figures are about to be opened to destruction by decision of the United States Bureau of Land Management. Current BLM policy is to open most of the desert to bikers, ORV's and strip miners, thereby insuring that the northern desert imageries will be destroyed as completely as were those in the southern, Yuha area.

The best means of preserving these sacred configurations will be to keep the general public at a great distance until a comprehensive air-and-ground study of them can be made. This work must be undertaken immediately.



XI

CONCLUDING OVERVIEW: A  
TALE THROUGH TIME

E. L. Davis

Desert People of Ancient  
California: A Scenario

The prehistory laboratory was like a totally vacant cathedral at dusk. Its empty dimness forced us to stare toward a white, immense table. Under a blaze of operating room lights it held attention riveted--a magnet.

-- If you'll follow me to the layout bench, you can view the CDCA jigsaw puzzle of prehistory. Better leave your coats and sweaters here. It's hot under the lights--and this show takes about an hour.

Everybody is looking at the lab-coated speaker and the binocular magnifiers dangling from their gimbals. The small audience walks back and forth examining the huge, largely empty table. A middle-aged couple glances at each other and raises their hands like school children.

-- Excuse us . . . we can here because, well, we're interested in the desert and in archeology. We looked forward to seeing your picture puzzle . . . but there's no picture . . . only a few specks on an acre of table. Isn't there some kind of story?

-- Yes, there certainly is, but with only a few pin-points to go on it's ninety percent educated guesswork. Never mind. We start where we can. The tale is a fascinating piece of the history of humankind--acted out over the

ages--right here in the California Desert.

-- Let's regroup around the puzzle table and run through it. Then we can go into my messy office for coffee and talk about it all at the end of the show.

-- The black and white scale up that side measures time by the inch: one inch = one thousand years. Here at the top we start with an arbitrary point 5,000 years ago (that's the way our contract read).

Five thousand years ago in Egypt and the Old World's Near East, agriculture and animal husbandry were already ancient. Urban life, centralized governments and royal lineages were established. Five thousand years ago in the Tehuacan Valley of Mexico, plant horticulture had been developing for several millennia and bands of people were beginning to form village communities: urbanism was on its way. Five thousand years ago in the California Desert, a long, hot dry interval (called the Altithermal) had run its course. Episodic return of shallow lakes and meandering streams attracted small bands of foragers to basins and channels that had long been uninhabited. Erosion and deposition masked old landscapes or carved them into new landforms.

#### Early "Desert Rats"

Here is where our story begins. We start with Pinto III--Stahl Site Pinto. Back off from the puzzle board a little way and squint your eyes. You'll see a rather populous cluster of little pins. The California Desert had quite a lot of Pinto between five and six thousand years ago.

-- Wait a minute. What are you talking about? What's "Pinto"?

-- It's a catch-all name for people and their life style that was the human picture in California Deserts during middle Holocene times--about 4,000 to 6,000 years ago.

-- So what were these folks like? What did they do?

-- Well, they were early "Desert Rats" who lived in little brush huts, hunted deer and rabbits (because horses and camels were extinct). They gathered plants, nuts, and seeds, some of which they ground with handstones and slabs.

-- You mean like the Pueblos?

-- Well, not exactly. Kind of ancestral to the Basket Makers who, in turn were cultural predecessors of the Pueblos. The "ancestors" had no agriculture.

-- Wow, that's a long time ago--what was the climate like?

-- More water than today. Less water than 10,000 years ago; much less available water than 20,000 years ago.

-- Remember that as we go back down that scale of time we are dealing with people and environment and climate. We are looking at Ice Ages come and gone, pluvials and droughts. People were the only animals who had invented artificial ways of coping with these catastrophic changes. People were the animals with traditions, with language for teaching accumulated knowledge to their kids. The tools these people had would make you laugh--cordage, stone knives, some bone and wood implements, baskets and skin sacks--can you imagine facing an Ice Age with a packload of junk like that?

-- The easiest way to bring these 5,000 year ago

California Desert people close to you is to show you a few scenes from the video tapes about them. Seat yourselves in front of the monitor screen. These parts of the Pinto scenario take about five minutes.

Amid shuffling and scraping of chairs, images form on the screen.

-- This first scene shows people in camp; daily life.

A brush hut stands in brilliant sun, casting one of the few shadows. People, naked and brown, sitting on the ground --an old man in the background, placidly weaving something, a young woman and two children. Using obsidian flakes, they are taking a rabbit apart for meat and fur. Yards of rabbit fur-string are looped over a creosote bush. Pink strips of meat begin to festoon another bush as the six year old boy drapes them over twigs under the woman's direction. "More in the sun. Turn these first ones. Oops, never mind, just get the sand off the one that fell. It'll stick . . . ." The four year old girl, already an adept butcher, cuts off a ragged pink strip and gives it to her brother. The obsidian in her other hand flashes in the sun before the monitor image dissolves.

-- Any questions?

Half a dozen mouths look questioning and the old woman exclaims:

-- I can't bear to watch--It's awfully dangerous--that child is going to cut herself! She's just my little grand daughter's age.

-- She will, but not often. Knife users don't hurt themselves because they learn not to as kids.

-- How did they get such a long fur rope off one jack-rabbit?

-- Easy. You start in the middle and cut a spiral round and round.

-- How clever! Then what do they do with it?

-- Look at the screen again--the old man comes into focus bent over a crude backstrap loom tied to a bush. Close up, his rough fingers push a fur strip in and out through a warp of plant fibers. Pausing, the weaver uses a stick to push the strands tightly together and a hand passes across the fur cloth, soft and dense.

-- This is their winter warmth: a poncho by day, bedding at night.

-- What do these people eat? They all look so healthy?

-- They eat the health of the desert--pods, roots, animals, seeds, cattails from the marsh, larvae and ant eggs.

-- EGGS! How revolting!

-- Oh? If little eggs are repulsive, why is caviar so expensive?

-- Now, let's go back to our picture puzzle of California prehistory. Get up and move around. California people were moving around too, between 8,000 and 8,500 years ago--only the action seems to have taken place farther north in the desert. Down here, things got pretty dry but up north there were huge mountain systems--the Sierras, Cosos, Panamints, the Funeral Range. Mountains are rain machines.

They squeeze out the clouds, guide the storms, store the water for years.

-- Look through your viewers, glance at the monitor screen once in a while and you'll see some new people appear in a different landscape. The people have flatter faces, they wear more clothes and the foothills have more grass, shrubs, parkland. Perhaps there are more elk and bison around because the men hunt them with very large and long spearpoints. We know more about these "Haskett" people in the Snake River Plateau of Idaho. This particular scene is probably about 8,500 years ago at China Lake.

#### The Last of the Mammoths

-- Before this time, between 8,500 and 11,000 years ago, California climate began to change for the worse. There were a number of warnings of rough days to come for People of the Marsh: the beautiful lakes with their bountiful swamps began drying up. A valley would go dry, becoming a dead salt pan. Then shallow lakes would reappear but only for long enough to lay down sand and clay; not to raise a profitable marsh, green, full of birds and waving in the sun. People had to leave the valley but they watched it from the highlands and old people, the story tellers, handed down tales of a golden age when things were good. And several times they did, indeed, become very good. A lake and its greenery returned. Quickly, people from the canyons and pinyon forests moved shoreward and, briefly, they once more became People of the Marsh who, seasonally, stuffed themselves with duck.

-- Heavens. How do you know all these details?

-- Simple. The lake wrote its autobiography in delicate stratigraphic chapters. We can read these pages from the

earth if we expose them neatly in a trench or core.

Silence. A gentleman with rugged features exclaims.

-- Astonishing! What is there to "read" and how do you read it?

-- In the stratigraphy. When the lake was very deep, blue unoxidized clays settled on its floor. As it grew more shallow, tan (oxidized) clays filtered down. As water became shallower still, clams and snails burrowed among sparse water plants. Along protected margins and ponds, cattails and bulrushes grew into dense jungles while sedge spread over the banks. Each marsh wrote its chapter in the lake history as a dark stripe of peat, easily recognized and also datable by the radiocarbon method.

A young woman in bluejeans asks:

-- Did the lake people have any form of writing? They must have been very anxious about their grocery store closing up. Did they leave any inscriptions?

-- They certainly did. Not exactly in writing but in a universal language of symbols. They created huge pictures on the ground by setting out lines of small rocks. Look at this.

#### Ground Plan for a Rain Dance

The audience move their heads about, trying to get a better view.

-- Crazy! What is it? I can see some lined-up rocks that don't make sense.

-- Over there's a big pile of them.

-- Look at this, now, a vertical view of the ground figure from a balloon. Concentrate here. Can you see a snake's head with its tongue sticking out?

-- I see another.

-- Are there maybe three?

-- And they seem coiled together.

Drumming is heard, rapid, insistent, on the sound track. A figure emerges on the screen, a man dancing. He wears paint, feathers and a headdress surmounted by two small horns and a bird.

-- The Shaman. The transcender. The person who moves between the three worlds, a guide for his people.

Other figures in pairs move across the image; some close, some distant. They stamp the earth rhythmically, chanting with muscular, throaty voices a remarkable sequence of different tempos. Sharp transitions are perfectly executed in unison by all the performers punctuated with the Shaman's drum.

-- You're watching a bit of the last of the Pleistocene religion: control of the animals, food and fertility. But some new and very important actors are present in this multi-media drama. The Serpents, masters of water and rain. The people are using every art within their repertory to invoke the powerful serpent Being to release the waters tied up in the earth and restore the lake.

-- All over Northern California Deserts, these configurations still lie in the ancient pavements; records of great collective presentations by people who saw their life-giving marshes dying and besought Great Powers to restore their water.

We are lucky to have recorded a few of these sacred images before the wheels of ORVs and bikers got them.

-- We must hurry now. We're still at the foot of our puzzle table and there are almost 200,000 years to go. Here is our last real action strip--right across the board between (we think) 10,000, and 13,000 years ago . . . maybe.

-- Why don't you know exactly? Don't they teach this in college?

-- No, on the contrary. California prehistory before 10,000 years ago is considered disreputable like sex for seniors or like picking up coal beside the railroad tracks.

-- But don't the professors find it exciting to have very ancient people in California like very ancient people in Europe?

-- Dear madam, NO. It isn't fashionable . . . yet. Science has waves of fashion like styles in men's collars and ladies' shoes. If you're unfashionable, people throw clods at you like an unpopular kid. Now, let's get along. See how there are many little scenes of action near all the lakes-- Manix, Cahuilla, China, Panamint. This is the Lakes Country at its best.

-- What were these people called? The Who?

-- Well, in their different languages (California was a regular Tower of Babel) they called themselves THE PEOPLE, of course, and their neighbors called them Big Fish Eaters or Camel Eaters or Wood Rat Eaters, whatever. We have named the folks of 10,000 years ago PaleoIndians in general. In particular, archeologists have a parcel of names for them-- San Dieguito in the southern desert; Lake Mojave or Silver Lake people in the central desert; in the northern Lakes Country (like Panamint and China) there were combinations like Lake Mojave and Clovis. At Lake China they dined out occasionally on a mammoth or camel. They really porked it up.

-- How fabulous--a California Super Animal Park, eh? But why not also at Bristol--Cadiz lakes and the lake in Death Valley?

-- Oh, but there WAS action there. Lots of it, only it took place far back from the contemporary salt pans and is mostly buried under some of the biggest alluvial fans in the country.

-- Goodness! Why aren't the archeologists finding all this STORY?

-- Because archeologists are looking for visible s i t e s instead of reconstructing old hidden landscapes and figuring out where people lived in them. That, folks, is the name of the game and the most fun. When archeologists begin this kind of New Think (which is old hat to the geomorphologists) there will be ancient sites and ancient dates all over California.

-- Now, let's walk back to the screen and watch a short film from Ice Age California. This is called "Ways That You

Can Kill, Butcher and Package a Mammoth\*\*. We've trimmed all the rind off this flick and just left you the heart. This is what China Lake, Basalt Ridge looks like today: baked desert and black basalt; a few shims of mammoth ivory scattered around; fragments of a huge tooth, the condyle of a jaw, a lot of lithic flakes and artifacts. The rest of the footage is what happened 11,000 or 12,000 years ago; a California mammoth hunt at China Lake in an area we call Basalt Ridge Embayment. When the lake was almost full, people who made fluted knives from Coso obsidian camped here and scored a mammoth. Let us say:

They sent ahead a pair of runners to reconnoiter the embayment and its environs and the report was good. This was a season of the year when clans of mammoths broke up into small bands according to age and sex--teenage males accompanying older bulls while cows and young ones together followed different whims both in territory and choice of food. The two scouts had seen a very large sire-bull attended by three juveniles, who had taken out a claim to a small gallery forest just west of the bay. In the cool of mornings they grazed the tall grass pastures, returning at noon to the little stream to eat water lilies, branches and cress, or roll and hose themselves down. Late in the afternoons they visited the embayment and had already worn a deep trail along the west slopes of the Ridge and into the marsh where they stuffed themselves with horsetails, cattails and sedge, feeling their way cautiously in the treacherous mud, which held if not violently disturbed. According to the runners, the bull was immense--"a monster; a mother's-brother."

Camp was immediately divided, old people, small children and some of the women moving to an intermediate base until called, while an effective work force of the able-bodied men, the rest of the women and older children picked up their gear.

---

\*Excerpted and revised from a story sold to Scientific American.

Most of them had short spears with special, deeply fluted cutting tips (improvements of the Proto-Clovis shouldered knives); and they wore shoulder bags full of hand tools--choppers, side-knives and little, serrated steak-knives for slicing meat. A few (who would work in pairs) carried long spears with deadly, killing tips--slender bone probes, tightly socketted and sharp as icepicks.

The plan was as follows: a single, experienced Watcher would occupy the Ridge to direct the others, silently, with arm-signals (elephants are near-sighted but their senses of hearing and smell are acute). A Watcher's Helper would circle around to observe the mammoths in the gallery forest and signal to the Watcher. The strategy would be to surround the large bull in the swamp, provided he isolated himself sufficiently from his followers. If he remained in close company, then the first isolated individual would be attacked.

By noon, people were in hiding downwind from the trail, as comfortable as possible, motionless and perfectly silent (no scratching, no fly-slapping). The Watcher was invisible in the basalt and tufa above; Watcher's Helper had disappeared toward a slope overlooking the gallery forest, selecting an alternate position in case a late thunderstorm brought wind shifts. The embayment was quiet except for a background of natural sounds--gusts riffling the cattails and bird activity.

Early in the afternoon, the four mammoths came filing back, having grazed for hours. A few stems of green still dangled from the mouth of the leader who paused at intervals to inspect a rainy season flower, pick it delicately with his trunk-finger, shake it to enjoy its bouquet and place it in his mouth with calm appreciation. After arriving in the little copse, the mammoths passed a quiet afternoon in desultory

feeding, drinking, rolling and digestion. The Watcher's Helper behind a small outcrop saw and heard most of this. Late in the day the sire-bull grew restless and moved off toward the bay, followed by his teenage escort. The Watcher's Helper ran to a vantage point to semaphore the Watcher, who, in turn, would signal the attackers. Everyone quietly picked up their weapons, watching the signaller, the mammoths and each other. The animals waded slowly into the swamp, feeling their way, feeding near shore and exerting no sudden pressures to disturb the gel of clays. Their positions relative to each other shifted several times before the look-out began signalling and the attackers, silent as cats, drifted from bush to clump, surrounding the bull in a shoreward arc to which his back was turned. The undisturbed mammoth continued feeding, occasionally flapping his ears. At another signal, he was set upon by a yelling, stabbing mob while the juveniles ran off. Startled, the bull forgot his careful footwork, trying to turn and plunge for shore but sinking into the ooze far enough to lower his belly by a meter or so, placing it within easy reach of the spears. Instantly, sharp weapons were cutting into his Achilles tendons, disabling his hind-quarters so that he sagged down and back, exposing the targets of lungs and heart (an elephant's heart is low and forward so that it can be partially covered by the foreleg). Two lancers planted a bone probe in it as other spears cut into arteries at the base of his neck. As the mammoth sank, another pair of spearmen with a long staff lanced him through the eye into his brain and the bull was dead--so quickly that the juveniles barely had time to disappear over the hilltop. The giant rolled over with a Leviathan splash.

At this point in an elephant hunt, Pygmies would have swarmed over the body at once, but the Clovis people had their own liturgy for completing the drama. A high, quavering call came from the shore and everyone began wading back to land

while an older man (the Shaman) ran down the beach. His face was painted half in patterns and half in solid color; he carried an unusually short spear decorated with magical objects--teeth, shells and bright feathers of birds. In a general silence he made his way to the kill. Climbing on top and spreading his arms over the mammoth he turned his head from side to side, chanting a song of thanks. The animal was their Brother who had helped them--thank you! The bull would return in years to come to lead a long life with his seed after him. The Shaman tied red feathers to hairs on the mammoth's ear, then standing on its haunch with feet apart, like a blubber-room man on an old whaler, he used the short spear to slice the ear free, offering it to the four directions, the zenith and the nadir, after which he presented it to the Lake with a loud splash.

Dusk was falling, but everyone who could find room crowded aboard and Primary Butchering commenced. Some worked to remove tusks and trunk, preparing the head to be rolled and skidded ashore, while others began attacking the limbs at elbow and knee--tasks which were interrupted by night. In the blue dawn they were resumed. Word had travelled afar and little groups of kinfolk began converging like seagulls at a whale-feed. The stripped-down head and legs were beached together to be dismembered and boned, jaw and brain were removed (which involved smashing most of the skull and the mandibular condyles) while other butchers worked on the huge carcass which was already beginning to bloat slightly. These people used both their sharp-bladed spears and also another invention--razor-sharp steak-knives with little teeth like hack saws. With these, thin strips of meat were rapidly flenched, piled on improvised trays of woven reeds and carried up the beach to camp. At this point, three butchering stages were being carried out almost simultaneously--Primary (the removal of large segments for beaching); Secondary

(boning out and retrieval of edible parts of these segments); and Tertiary (thin-slicing meat for the smoking racks). As the mammoth's rib cage stood out white, the body cavity was eviscerated and invaded for the prized heart, liver, kidneys and testes. The fatty mesentery was draped over a bush while heart fat and kidney fat were eaten by senior hunters and the Watcher. Meanwhile, a line of people with meat in trays and in carrying nets of beautiful cordage moved up the beach like ants, heading for camp and the long task of Packaging (smoke curing all uneaten meat and packing the wood-dry product into nets and openwork sacks for storage). Pits were dug, smudge fires lighted in them and wood details combed the countryside for fuel of any kind including dry mammoth or bison chips. Low grids of sticks and conical tents of brush were constructed over every smudge while a day-and-night-smoking operation began. Fires were constantly tended; meat strips were carefully watched and turned. Since all meat was continually in the smoke, no flies settled on it although the process required many days of attention. After fleshy surfaces had become thoroughly glazed and smokey so that they could not be fly-blown, the process of drying could be finished in the hot sun and dry air. After this, open half-shelters or ramadas were built and the dried food was hung in them, open to drying wind but protected from late rains. Jerky like this would keep indefinitely. It could be chewed as a quid, pounded on a rock with moist plants or berries, or soaked in water. Down in the marsh, the rib cage of the donor mammoth whitened in the sun, visited by ravens and eagles during the day and by a few coyotes at night.

-- Now let's go back to the table. We'll look at California's vast blanks and question marks.

A realtor in a business suit asks: -- How do you know

all this animal hunt really happened--so long ago?

-- We don't know. We infer. We put together information and behavior from many sources--herding habits of African elephants; hunting and meat preservation practices of Pygmies and West Africans, Bushmen, Basin-Plateau Indians of the past century. What we offer you is not a certainty like the moment of sunrise tomorrow, but a theory, a proposition that is compact and explains many, disparate fragments of evidence: a broken rock, a weathering bone, a position in a landscape. When we have more evidence we'll be able to devise a better proposition to package this little episode in California's desert past.

-- But that past looks so empty, from here on back to 200 inches--200,000 years. Would you tell us about the three or four remaining little pinpoints?

-- California prehistory reminds one of a single B-B shot, lost in Westminster Abbey.

-- A needle in a haystack.

-- OK. Let's eyeball the rest of our puzzle-board and here's what we've got. The big thing we've got is the people who find this stuff. It's a fabulous story. Many of them are "amateurs"--the Learned Avocationals of our book. These are average citizens, people like yourselves: Hayden (a cement contractor); Childers (a building contractor); the Winslows (a painter of beautiful desert scenes, and her machinist husband); Minshall (an art teacher with some training in geology); Begole (an engineer); Simpson who is a museum curator with an MA degree is the pro of this Old Guard of early desert buffs. Simpson is Ms. Calico. I guess that I rate too--as Ms. China Lake and Panamint.

Espousing an unpopular cause is an interesting act in the scientific vaudeville show. You dodge a lot of rotten eggs. Well, this is off the subject of the Big Blank. We have a lot of rough tools and rock rings in the Borrego area-- probably from 10,000 - 12,000 years ago when the moist cycles occurred. Then we also have from one end of the CDCA to the other an occasional odd-ball rock like these.

Several non-committal stones of different materials appear and turn slowly before the viewers' eyes. The objects are faceted here and there. Flake scars are visible in a few places.

A tall, well-dressed woman looks unconvinced.

-- But they don't have any SHAPE . . . !

-- Oh dear, I know. That's what they used to say to me when I was in high school. Discouraging. It depends on what you are accustomed to accepting as "good looking." I was compared with Playboy bunnies and you are judging the California Desert's questionable rocks with sleek arrowheads. We belong to different worlds. An archeologist looks for just one, priceless ingredient in very, very ancient objects --some sign, some manifest of human touch. Often the sign is incredibly dim, like last year's animal tracks.

There the rock stands, alone, without confirmation.

-- You look for other clues, like some pattern of fabrication; systematic handling of an edge. Or the kind of stone isn't native to this part of the countryside, so did somebody pack it in? These rocks "speak" to us desert rats. They are strange. Part of the art of science is learning to spot anomalies.

-- We're almost through with our scan of the desert's empty spaces. Look through your viewers and you'll see a crushed, human skull and a few bones coated with a limey deposit--the Yuha Burial. Two "ridgeback" artifacts were found with the burial. It has dates of about 22,000 years on the calcareous deposits around the bone. The bone itself has not been dated. So there are questions.

-- Next we move up north to China Lake and see a piece of mammoth tooth with a little white stone flake and a little black flake. The three objects were excavated in one small wad of clay so a date on any one of them should apply to the other two. Enamel from the tooth dates at 42,350 years. Forty-two thousand years ago, a person and a mammoth ran across each other here.

-- Look at the long interval now, between 80 and 200 inches (or thousands of years). We are literally "on the rocks" because stone and geology are all we have as evidence . . . no dates are available yet, only position in geological deposits. Ready?

#### Pinto Wash

-- This sub-title takes our story back to the southern part of the CDCA, right near the U.S./Mexico border. Five years or so ago, an October hurricane dumped seas of water on the desert side of the Pinto Mountains, creating a wild flood down the wash and cutting back its banks. This fresh exposure revealed an old spring deposit. Nearby some chopping tools were found, loose. Others were discovered later, still embedded, 60 feet below the surface. Geologically, the spring and artifacts are ancient--80,000 to 125,000 years.

A brown-faced young man with a black beard and the old

couple have their heads together, whispering. The bearded man asks:

-- What did these people look like? Were they like European Neanderthals with massive faces and powerful hands?

-- We don't know. We're not dealing with Europe, but with People out of Asia. There were probably both Caucasoid and Mongoloid ancestors shaping up over in Southeast Asia, eastern China and what is now the Soviet Far East. There's so little information yet. Let's base some guesses on what is known from Chou-kuo-tien, the famous Chicken Bone Cave west of Peking. Human remains from the Upper Cave at Chicken Bone were varied (more like modern populations including Eskimo).

They weren't Neanderthals. Perhaps the exaggerated, Neanderthal forms of glacial Europe did not evolve in China.

-- What are we waiting for? Why don't we know?

-- Because the brains--and--money, energy are all going to research Africa rather than Asia and certainly not the New World. Our answers to our questions lie closer to home than Africa and many of them are buried in the California Desert. Now we'll take a couple of last looks at a very interesting group of deep excavations called the Calico Site. The Calico Site is a battle-ground between radicals ("it's very Ancient Man") and conservatives ("it's only naturally fractured rocks").

#### The Calico Site

On the screen appears a finely shaped stone object of mottled jasper. It is a tapered cone, with a number of

fluted, parallel facets. Shatter-marks at top and bottom are scars left by blows that created the flutes. The audience stares silently, until an elderly man asks:

-- Did somebody make that?

-- We think yes. It's a polyhedral core. People were striking long slivers called blades off cores like this one. It's too symmetrical, too complex, to be natural. Too many inter-related operations had to be performed on this little piece of brownish stone in order to shape it like that. It was squared off at top and bottom. It was faceted. It had one long, perfect flute removed from end to end. And the little shatter or chatter blemishes at the extremities show where force was applied--accurately. Nature just hits somewhere. A person aims.

-- How old is it?

-- Judging by the geological position, from before the last Ice Age, it's pretty old. It was excavated nearly seventeen feet below the surface in a complicated fan. Age-wise, we think it's 80,000 to 125,000 years. But it may be a lot more; look at this stuff from the same load.

New images materialize on the screen. The camera eye moves in close to a roundish object and a smooth, concave surface.

-- What is it?

-- What are those things?

-- They're a cobble that was excavated near the little core you just saw, and a piece of a carbonate rind--an

incrustation--that formed on that cobble. The very inner-most layer of the crust is being dated and will probably turn out to be about 190,000 years old. Believe it or not, we're just getting started on the desert mystery story.

-- Fabulous. It's like a Whodunnit movie . . . .

-- It IS a movie. It's California's great Desert Scenario looking for a producer.

-- Now let's go into my office. There's refreshments and material for you to read.

#### Cultural and Natural Values of the CDCA

The CDCA is a top-priority region in which to pursue studies of early environments and early peoples. No region in continental North America is so controversial, poorly understood and yet exciting in its promise of yielding paleoclimatic and paleoanthropological information if systematically investigated. In order to mount a successful attack in these unkncwn areas of our own human story, we need only a few of the resources that are abundant in our rich and technologically advanced society. We need funds, clear objectives, small (but superlatively qualified) interdisciplinary teams of hunters, some theoretical models, open minds and a willingness to step into the unknown.

#### Laws of Operation

The following laws govern successful model construction for desert archeology.

First Law: a geological/climatic framework is required for modelling cultural continuities with time-depth.

Second Law: positions of Pleistocene sites cannot be predicted by sampling a modern landscape. Instead it is necessary to reconstruct and sample a Pleistocene landscape. Where were the marshes and springs?

Third Law: this reconstruction process is controlled by knowledge of geomorphology and not by random-numerology.

#### Continuities

No other archeological theater in North America offers so fine an opportunity as the CDCA for examining cultural continuity and change. The spread of such recently acquired traits as horticulture and pottery making are examples. They spread from Nuclear America (Mexico) through the greater Southwest thousands of years ago. Crossing the Colorado River they slowly took root among Native American bands of the California Desert. Pottery, for instance, reached San Diego County by A.D. 600 (Stanley Berryman, personal communication, 1979) but may not have been adopted in the Owens River Valley until the eighteenth century (1750?). The rate and directions of diffusion could be traced if sufficient attention were given to these problems in the CDCA.

The appearance, modification, diffusion and disappearance of fluted knife/points could similarly be studied over both time and space in the CDCA by placing these phenomena within regional, geological and climatic frameworks. The fluted objects are most likely to occur in association with rapidly oscillating lakes (and shorelines) during changing climatic regimes of the Holocene/Pleistocene boundary. Owens, Panamint, China Searles and Death Valleys are examples. China and Panamint stratigraphies provide excellent Clovis/Lake Mojave laboratories. A fluted point (and matching crescent) were found at Site INY-19, in Panamint

and are now in the collections of the San Bernardino County Museum. Several dozen of these highly valued little time-markers have been recorded during the China Lake surveys (Davis, editor, 1978c) and are in the collections of the Natural History Museum of Los Angeles County.

The continuities and changes within this Western Lake Mojave/Clovis phenomenon can be studied broadly on a regional basis and over climatic time by correlation of: a) lake-shore soils, and b) lakeshore peat bogs. We now know that the peat layers (at Lake China and the north basin of Lake Panamint) seem to correspond. It is like a local correspondence in tree rings. Lake Hill Site INY-19 and the Sewage Pumping Station at China Lake both show three peat layers that run (from the bottom upward) strong, strong, weak. These can be dated and their relationships traced. The connection of the bogs with archeology is expressed in another law:

Fourth Law: desert people were People of the Marsh whenever marsh conditions were available. A strong peat in a geological section points to nearby archeological remains on an adjacent, terrestrial paleosol.

I therefore suggest that a Lake Mojave/Clovis phase in the CDCA corresponds with two bog-related episodes: a) the lower peat at both China and Panamint; b) the mucky, organic-rich gravel with clams at Lake China. (There should also be a clam layer at Panamint but further work is required to find it.

Antiquity of California Desert People:  
200,000 Years Plus?

The CDCA offers prospects for establishing Paleolithic

chronologies for early PaleoAmericans. More work needs to be done. Therefore the following dates and age-brackets are only starting points.

1) There is now a uranium disequilibrium date of 42,350 years on a mammoth tooth excavated with two sophisticated, lithic flakes at China Lake. This date is a radiometric measurement that is independent of carbonate contamination. It provides a solid, Pleistocene date for California Desert archeology. The specimens were buried in a dense, laminated, carbonaceous clay that was banded horizontally with reddish layers. A lake-margin environment is suggested. The elevation is about 2215 feet above mean sea level indicating a high (but not highest) stand of Wisconsinan Lake China.

2) Artifacts exposed deep in the Calico excavations were embedded in a matrix of fan that falls within a geological time bracket associated with Pleistocene changes in sea level: Marine Isotopes Stage V. This stage is between 80,000 and 125,000 years in age. Both the famous "hearth" (Chapter 10 ) in this report and a polyhedral core of jasper (Figure VIII:3) lay within this deep level of the Calico Fan.

3) The Pinto Wash tools of Childers and Minshall (1980, in press) lie embedded in deposits of a once-flowing spring more than twenty meters (65 feet) below the present surface and just above the (early Pleistocene) Palm Springs Formation. This position in the geological section possibly brackets the steep-edged, non-morf tools at approximately 125,000 to 190,000 years (Marine Isotopes Stage VI). Relation with the spring, however, is an unknown quantity that must be further explored.

These ages and age-brackets represent a bold, quantum leap for California prehistory. Instead of fighting in circles about "pre-Clovis" we are now more free to move on to the open plateau of the entire Pleistocene. Intensive investigations are needed: the kind of investigations required to discover oil or a cure for cancer.

A New Time Base for  
New World Sacred Arts

In Chapter X, the Three Great Serpents ground figures is described. A time period for this figure probably coincides with three episodes of low-lake stand and bog-formation in the lake valley. The time brackets of the three bogs seem to lie between 8,000 and 11,500 years ago with a radiocarbon date of 10,500 years on the middle bog (at UCLA Site INY-19).

This estimate, if verified, would point to the California deserts to supply a baseline for the New World's oldest forms of sacred art. Therefore, special programs must be devised for recording the CDCA ground figures (see Management Recommendations) with remote sensing--immediately; before they are all destroyed.

GUIDELINES FOR DISCOVERING  
ANCIENT LAKE SITES

The Paleo-Lacustrine  
Component: Bogs

Observation of desert lake valleys, of geological sections of lake shore and of California ethnographic literature suggests the following 1:1 relationship between people and lake: the lake marshes were the subsistence foci. Recent Shoshoni; the folk who camped in Lovelock Cave; the

proto-historic Indians who lived around Lake Cahuilla; PaleoIndian campers in Panamint North Basin and PaleoAmerican camel scroungers at Lake China--all did their grocery shopping in a marsh.

Why?

Because a marsh supplies plant foods; bird foods; some large mammal foods, and lake-creature foods. The swamp also supplies such industrial raw materials as reeds, rushes, roots and fiber.

Marsh traces can be disclosed by a) coring; b) trenching with a machine in a knowledgeably selected place; never by random-numerology-guesswork.

#### The Paleo-Terrestrial

##### Component: Paleosols

A marsh was the subsistence focus whenever topography and climatic cycles permitted a marsh to form. So where did people camp--on the nearest dry beach (Sites INY-19 and -20), Panamint) or on a ridge with an overview (Stake 25 Bench at China Lake).

The dry surfaces were frequently stable (unchanged by either deposition or erosion) long enough for soils to form by processes of weathering and calcium carbonate deposition. Forms of these calcareous deposits ("pedogenic nodules") are frequently characteristic of eroding, buried paleosols and provide clues for the archeologist who is in search of the lithic materials once contained in those paleosols.

#### Synthesis

In working with ancient human traces, we are therefore

working with the ancient landscapes and environments that were those humans' habitats: the old marshes and old soils. Ancient landscapes and their sites will not be found by sampling modern topographies. Instead it is necessary to reconstruct and sample progressions of Pleistocene and Holocene landscapes.

These patterns of thought and procedure are called Geoarcheology in this report. Geoarcheology has been a determining factor in constructing some of the preceding chapters. Geology and climate provided a framework, changing through time, within which little groups of clever people made the best of whatever Nature had to offer.

Many generations later, an archeological sleuth following a trail of clues is struck by the grandeur of this desert scene, the complexities of its webs of life, and the fragmentary state of its human record. I have attempted to connect these fragments (like stringing beads) by hooking little stone pieces ("morf")s together on long strands of tradition ("teks").. The Master Chronology Chart (that serves as a basic diagram throughout the chapters) combines in synoptic form climatic oscillations; progressions of morfs and teks; a résumé of the most widely-used archeological nomenclature and a sense of expanded residence time for the Paleo people. The Chart goes back for a mere 40,000 years but this is enough to get us started with a different format for New World prehistory.

Forty thousand years puts us in mid-Wisconsinan times. It is therefore a psychological change from the endless, petty bickering over "pre-Clovis". Clovis, like pottery, has to be placed in perspective.

We need a quantum leap: a series of 100,000 and 200,000

year radiometric dates on the matrices containing New World Paleolithic tools and bones (human bones). We need to discover the bones themselves in order to date them.

Suggestions for  
Preservational Management

Immediate measures:

First (and this must be treated as an emergency) a program should be designed, funded (by California and federal agencies) and launched to find and record as many Ground Figures as possible. They are incredibly fragile and must be incorporated in the national archives by:

- a) remote sensing (aerial photography)
- b) plane table mapping
- c) mapping and collection of associated artifacts
- d) a special publication series--possibly under the aegis of the National Academy of Sciences and the Smithsonian Institution. The figures will thus be preserved (in black and white and color) for future study and interpretation.

Both Jay VonWerlhoff and I propose that ground figures express human responses to catastrophic, climatic changes. The lakes dried up. Social, esthetic and religious expressions of stress are eloquently depicted in the serpent/water correlations of some ground drawings.

A plan for mitigation by recording of the ground effigies is shown in the left-hand column of Figure XI:1. Right-hand columns enumerate the procedures for archeological excavation and for reconstruction of the paleoenvironment at Sites INY-19 and INY-20 (Lake Mojave/Clovis and Lake Mojave/Silver Lake periods). This research package has been

designed as a model (mentioned at the beginning of this chapter) to serve as a baseline for interdisciplinary investigations of Early Human Activities and Cultural Remains in the CDCA.

XII

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VIEWS OF ARCHEOLOGISTS:  
AN APPENDIX

XIII

Appreciate your including us for input to the BLM report on Paleo Americans in the California Desert. At present this Office is drafting a proposal for a comprehensive inventory and evaluation of cultural resources on lands controlled by the Naval Weapons Center. This will provide a framework for locating, identifying and evaluating the prehistoric and historic cultural resources on the Center, thereby facilitating their preservation and management.

As you know, an exceptionally high potential exists here for the presence of significant historic and prehistoric cultural features. The diversity of terrain and ecosystems and particularly the long-term relative lack of disturbance lead to this conclusion. Therefore we feel all areas of the China Lake Test Range Complex and Mojave "B" are potentially sensitive. Specific cultural resources, including Early Man Sites, will not be pin-pointed until the comprehensive inventory can be accomplished.

For purposes of the BLM report, I suggest inclusion of the canyons on the last toe of the Sierras for continuity. I am glad to see Fish Lake Valley included. Deep Springs playa and valley may also be relevant.

I will let you know when the comprehensive inventory takes shape.

Tilly Barling  
Department of the Navy  
Naval Weapons Center  
China Lake, California 93555

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I've been pondering my reply to your letter concerning the BLM Desert Final Report. The sites or area sites I have accumulated over the years are filed with site sheets, on 71/2 of 15 Quads and Auto Club County maps. For example, my San Bernardino County maps alone have 12 categories in The Key, i.e. petro, picto, paleo, shelter cave, dune site,

etc., and while it would take a considerable time to relocate them on a large map, on the 8 1/2" x 11" map supplied it would be impossible. The same holds true for San Diego, Inyo, Imperial, Riverside and Kern Counties. My Anza-Borrego Desert Master Quads have hundreds of area sites with more sites in the process plus state land sites on the Colorado River. Often I may study an area for six months to a year before recording and mapping my first site.

It appears to me that you have taken on a formidable job that should be done by BLM. As you know, for years many of us have filed maps and site sheets with the State, UCLA and then later with the Regional Archives. I would think it prudent for BLM to send a paid representative to these depositories to copy these maps. Also, with the provision of a large BLM desert map, try to enlist the help of organizations and private desert prowlers. My experience is that the latter are sitting on 95% of the best desert information.

Although I don't mean to cop out on you, at this point I can only offer a few suggestions and extend my sincere condolences to you on your project.

Robert S. Begole  
722 North Pine Street  
Anaheim, California

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The area you indicate is really outside my area of true expertise. I once worked in that part of the world, but now have let research there get ahead of me. Nevertheless, I would like to point out, as others no doubt will, that the Rose Valley site, just east of the Coso junction, has produced an extensive Paleoindian component as reported by Ferris Borden (1971)

in a monograph published by the Archaeological Survey Association of Southern California (or was it the San Bernardino County Museum?). The Little Lake site of Harrington (1957) also exhibits a paleoindian component as do several sites on the southern shore of Owens Lake.

These observations will probably not come as a surprise to you, but I thought I would send them anyway as a show of moral support.

Robert L. Bettinger  
Faculty of Arts and Science  
Department of Anthropology  
New York University  
New York, N.Y. 10003

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I wish I could help more, but I guess that those active in the area will have to do the real work. My worry is that aside from Morlin Childers Bob Begole, Dee Simpson, etc. no one will be marking the really ancient sites.

There are odd sites that I know of that will surely be overlooked. E.G. near Cronise Lake there is a midden with fresh water mussel shells and Pueblo sherds. I can't spot it on the tiny map you sent. There are the extensive areas of ovate biface work around the foot of Clark Mountain in the California-Nevada border area, west of Las Vegas.

Someone should look at M.J. Rogers' site maps in the SDM for a pretty good survey of important sites. An immense amount of the desert is archeologically important - all old shcre lines, most old drainage lines, some ancient pavements, etc.. The problem is that one can't simply close off the whole thing, and it is sure hell to try to pin point the important areas. And protecting them is still worse.

Clark Mountain, Imperial Valley - a whole vast area of ancient quarries on its shoulders. More material scattered for miles on the old shore lines to the east. Morlin of course is the authority for this area. Dee Simpson's survey of the Mojave of 20 (?) years ago must have resulted in maps of critical site areas.

Wish that I could do more.

George F. Carter  
Texas A.&M University  
College of Geosciences  
College Station, Texas 77843

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....a Marine Corps major on an inspection tour at Camp Pendleton stumbled over a site in the 100 foot terrace. Pebble tools, a jawbone with teeth (some mammal). The material is non-diagnostic - not La Jollan, or Texas Street or Ovate Biface - so far as the grab sample allows one to judge.

The implied age is awsome. The 100 foot terrace would be 200,000 years on the usual count - stable coast. On the Friends of the Pleistocene tour we were close to this site, and were seeing old age phenomena on a lower terrace - as well as I can judge from this distance in space and time - and this implies lowering of the area - down warping and this would make the site even older. Ah me. Arm chairing won't do. Someone has to get out on the site and begin the work: elevations, soils, relation to the other terraces, dating on the bone and tools, etc. I have written Herb and sent him a sketch map. Also happened to be writing Ronald Olson and so told him. I'd hate to have the marines decide to widen the road and cart it all away. It has happened to most of the early, early sites that I noted 20 to 30 years ago.

Other than that I seem to just keep putting along - this is letter number 6 for today - 3 on early man - the others on diffusion. We are turning up tribes in America speaking European and Asiatic languages - just what the text books told us wasn't true.

George F. Carter  
Texas A&M. University  
College of Geosciences  
College Station, Texas 77843

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Please forgive the delay in answering your (undated) request of a month or more ago - there always seems to be more to do that there is time/energy for it. Indeed, yours is a "tough assignment", and I am pleased that you included me in your list, particularly because, as you stated, the "far-outs" are extremely vocal. I hope we will get a chance to see your work on the CDCA.

I think the evidence for the presence of humans in California as early as ca. 20,000 B.P. is now adequate. I do not think the claims for much greater antiquity than that have been substantiated. I expect, however, that someone may well eventually come up with acceptable evidence for a greater figure, but I would not venture a prediction as to how much greater -- I'm content to wait upon the evidence. Meanwhile, I have reached my own timing as a result of Hayden's work on the Pinacate, Haury's findings at Ventana Cave, Rogers' work in Arizona, the Yuha (and Truck-haven) burials, to list only a few examples.

I find Payen et al. (American Antiquity 1978: 43, 448-452) overly conservative, and I find the Carter "school" totally unacceptable in their claims for vastly greater antiquity of humans in the area.

I think that Carter and his followers delude themselves by not paying enough attention to such matters as the concept expressed as the strain ellipsoid in structural geology, metamorphism, rock fracture in all its forms, stream transportation, and the rounding of rock fragments, to list only a few. My position is that unless it can be demonstrated beyond question that a specimen could only have been given its form by human agency, then we must reject it; to accept "it could be" as equivalent to "it is" renders all other criteria meaningless.

I accept the dating of the Yuha burial for the following reasons:

- 1) it rests on three, rather than just one, date, obtained from different samples from different parts of the burial; 2) I cannot agree with the objections advanced by Payen et al because (a) so far as I know, the field work upon which their objections were based was not done at the time the burial was being excavated, but quite some time afterward when conditions were no longer the same. Bischoff, Childers, and Schlemon (American Antiquity 1978: 43, 747-749) describe those conditions as I remember them and, so far as I am concerned answer the objections satisfactorily.

In addition, there are my own observations. At Childers' invitation Julian Hayden, Bill Robinson (University of Arizona), and I observed inhumations in the desert, and the Yuha and Truckhaven burials were alike in all respects and differed from all the others in several ways, the most important of which, when it comes to dating, was the markedly greater deteriorations of those two skeletons. The Truckhaven date, incidentally, cannot be given any credence because the shellac unthinkingly applied to it fouled up the dating. Because of their similarity, I think it probable that the Truckhaven burial would have dated about the same as the Yuha one.

This has been astonishingly difficult to write! You asked me to be brief and I have boiled down successive drafts trying to reduce this to just one page, and finally gave up. Good Luck!

Paul H. Ezell  
Professor Emeritus  
San Diego State University  
Department of Anthropology  
San Diego, Calif. 92182

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In regard to your recent letter to our archaeologist on the PaleoAmericans in California Project, we provide the following information.

Our archaeologist's current area of specific knowledge lies in the western Mojave Desert, primarily the Antelope Valley. There have been archaeological sites reported there which fall into the early man category. Several of these sites have been tested and there are reports available on them. A possible early man site complex was reported on Edwards AFB (you were at those sites last year) and a paper on that complex was delivered at the 1978 SCA meetings (Sutton et al 1978, copy enclosed).

Further work was done for a highway survey just north of Rogers Dry Lake. This was a Caltrans project and several sites assigned to a Paleo-Indian period were recorded. One of those sites (Ker-322) was tested and has since been nominated to the National Register. The testing was done by Ann Peak in 1976. A copy of the report is enclosed for your convenience. An adjacent site (Ker-323), mentioned in Peak's report, will be salvage mitigated in the near future as part of a water pipeline project. Mark Sutton at Antelope Valley College will do the work.

There seems to be a possibility (Mr. Sutton discussed this with you

at times over the last few years) that Rosamond and Rogers Dry Lakes may be the remnants of a much larger Pleistocene Lake that filled a good portion of the Antelope Valley. An unpublished paper discussing that hypothesis is enclosed for your use. This paper was written by an avocational, but is useful. This idea is also brought out in Sutton et al 1978.

A very rough outline of the possible shore line of Lake Thompson is shown in blue on the map being returned to you. Please note that this shoreline is not documented but only extrapolated on the basis of current topography. The Lake may have drained into Harpers Lake and into the Mojave River near Barstow.

There have been several sites recorded in the Antelope Valley that had Lake Mojave Points at them. None of these sites are currently included in any reports.

Pinto Basin period materials are represented in the Valley at several excavated sites. W.S. Glennan excavated Ker-302 and published a report on that work (1971), which you probably have. Another site containing Pinto points (Ker-505) was tested in 1976 (Sutton and Robinson 1977) and you have that report. Work at another site, LAn-298, has tentatively established Pinto period materials there as well. This work was outlined in a recent paper (Sutton 1978) given at the 1978 SCA data sharing meetings. A copy is enclosed for your convenience.

So little work has been done in the Antelope Valley on early man that it would be almost impossible to draw a meaningful sensitivity map for the area. Areas of current known concern are shown in yellow on the attached map. Many other very sensitive areas have probably been omitted due to lack of dates.

We appreciate this opportunity for input to the project and if there are any further questions or comments, please do not hesitate to contact our archaeologist, Mark Q. Sutton, at (714) 256-3595.

for:  
Gail G. Givens  
Area Manager, Barstow Resource Area  
Bureau of Land Management  
831 Barstow Road  
Barstow, CA. 92311  
by Mark Q. Sutton

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Copy of Letter Sent to:

Dr. Jason W. Smith  
Robert S. Peabody Foundation for Archaeology  
15974 Mariner Drive  
Huntington Harbour, California 92649

Dated June 23, 1977

Your letter, paper and the artifacts sent to the Institute of Archaeology have been turned over to me. I am very glad to know that you had a new find, and think that communications between us will further our understanding and be beneficial to our science.

My opinions on the core and on the origin of American culture are outlined as follows:

1. I think your identification of the core is correct, whereas the question is, what kind of core it is. It has long been on my desk. Every now and then I took it up for enjoying when I felt a little tired. In my opinion, it is a "Bipolar-core" since it had not platform and the radial fissures are vertical. The stone was set with the round end on the anvil, while the narrow end was knocked by a hammer stone, long flakes or blades falling down around. My colleagues have seen the core, but they hold different ideas.

The bipolar flakes and bipolar core found in the Peking Man Site are

abundant but all in small size, whereas most of them only have the size of a segment of phalanx. We never found in ChouKoutien such large "Bipolar core", even I can say for all I know, that by now such big size of core is extremely rare in China.

However, bipolar flakes and bipolar cores in the traditional method for making stone flakes are very common in China. The big ones of Early Pleistocene age, discovered in Hsihoutu Culture Site, Juichen County, Shansi Province are different from the artifact you had sent to me. I believe the difference in forms is secondary, as for strictly speaking, same method do not yield same core.

2. As I see it that the earliest migrants not that entered America just for one, because that the materials discovered are out the same tradition. As for the Microliths, I think it originates from the North of China for the discovery here of it's mother-type of 28,000 years B.P. from Shihyu Culture. What's more to our greater pleasure, we have found Hsuchiayao Site, earlier than Shihyu Culture as well as that of Peking Man's Culture, thus may be fill the gap between these two stages. Now I am enclosing a copy of Preliminary report of Hsuchiayao Site.

3. By the way, I am glad to let you know a good news that Shensi Provincial Museum found in South of Shansi Province a Cultural Site rich in Microliths, estimateably earlier than 15,000 years B.P.. It provides more and more evidences to the hypothesis that Microliths tradition originated from the North of China. This Site also yields points similar to Sandia Points unearthed in America. But those implements like the Archaic Points found in America has not yet appeared in China for the time being.

4. I do not quite agree with the supposition that the stone

implements of America have an age of 100,000 years. For all I know, not any 50,000 years old materials have been found in America now. However, it is only a supposition. I am unable to pass more opinions on it, as I do not know the evidences of the supposition. I hold that it is' probable for the migrates to enter America at Würm Glacial Age, 10,000 years B.P.. The migrations may be assumed to have taken place during glacial regressions which exposed the Bering Bridge.

5. The photos sent by Dr. Brian O.K. Reeves from Canada have not been received.

6. At the same time, the core being sent to you under seperate parcel.

With best wishes.

Chia Lan-poo  
Institute of Vertebrate  
Paleontology and Paleo-  
anthropology  
Academia Sinica  
P.O. Box 643  
Peking (27), China

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From my knowledge of the Western and Upper Mojave Deserts I would say that the following areas offer a great opportunity for Paleo-Indian studies. By PaleoIndian I mean any techno complex which did not utilize milling industries as their major approach to subsistence. This would mean to me a date about 9,000 B.P. +, or roughly commensurate with the San Dieguito Complex.

1. The Cuddeback Basin - particularly the western shoreline which contains many sites which might be PaleoIndian in origin. These sites are small flake/chopper loci. Also present are sites with carbon - perhaps roasting pits. The eastern shoreline of Cuddeback has not been investigated but may contain cultural materials. Problem: some disruption

by mining and grazing. Also: Cuddeback Gunnery Range Research Potential; very high - needs to be done within the next 10-20 years.

2. Searles Lake - many recorded sites, most are gone due to previous collecting activities. Many have disappeared due to mineral exploitation. Still a potential on the ancient shoreline and terraces. Needs immediate attention since the chemical operations plan to go on for another 100 years.

3. Nelson Lake, Drinkwater Lake, No Name Playa on Fort Irwin Military Reservation - definite PaleoIndian materials at the three above including what appears to be Mammoth or Mastodon bone at No Name Playa. San Dieguito material at Nelson and Drinkwater. Potential of being destroyed by Army maneuvers is ever-increasing. Nelson Lake has been decimated by the Brave Shield 17 operation, fortunately the subsurface was not affected. The Army does not seem to give a blast. The fight, though, is not lost since numerous letters are being written to them by various archeological groups including SCA, BLM, IAS, SDCAS, etc.. A letter by the Great Basin Foundation certainly would not hurt.

4. Manix Basin - including the Mojave River Terrace contains much in the way of early American artifacts and sites including associated cave sites in the Newberry and Cáve Mountains. You should talk with Chris Drover about his Cronese Lake studies.

5. China Lake to Searles Lake Slough - basically Indian Wells Valley - Poison Canyon - high potential, only a few known sites.

6. Harper Lake and Mojave River Overflow system - no known sites which are early but a high potential for early sites along the shoreline. Rick Hanks did some studies here. The Water Valley Dunes contain at least Pinto materials, maybe earlier occupation material since much of the eastern

Harper shoreline in this area is covered by extensive dune systems.

I hope this helps. Good Luck.

Russ Kaldenberg  
Bureau of Land Management  
1695 Spruce Street  
Riverside, Calif. 92007

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The questions you ask about early sites are big issues and require a lengthy essay to discuss. Since I don't have time to write the essay, however, I will give you a short answer at serious risk of oversimplifying my own position as well as a complex set of problems.

Establishing the validity of any site and set of archeological findings (regardless of age) requires three things to be demonstrated:

1. Man was present (i.e. you are not looking at natural phenomena)
2. You know the age (i.e. are not just making a blind guess or dating it within such a long time span that almost any age is possible)
3. You haven't been fooled by the associations (i.e. the associations between the parts of the evidence are what they appear to be -- the bones actually go with the layer where they are found, the fossils are the same age as the artifacts, etc.. Often this includes the association of dating evidence with human remains -- usually what you are dating is a piece of charcoal and it is an association that tells you your human remains are of that same age).

It is much easier to demonstrate these three things for late sites than it is for early ones. I don't know any site in California claimed to

to be more than 15,000 years old that can demonstrate all three of the things above; some of them can't demonstrate any of these basic facts. This does not mean that some or all of the very early sites will not prove in the future to be valid; it just means that convincing evidence (at least convincing evidence to me) is not firmly in hand.

I would not want to discourage researchers who are devoting immense time, effort, and talent at the search for Early Man sites; it is not likely that such remains will be found unless some set of scholars is actively searching for them and working to find the evidence. Further, it is more difficult than the usual excavation work and requires special knowledge of many kinds. So the fact that I do not leap enthusiastically at some of the individual sites and finds does not mean that I do not appreciate and value the work of the scholars concerned.

One trap in this research is perhaps unavoidable -- whenever you solicit funds for research you cannot avoid making an implied promise that you are going to be successful and find what you are looking for. No one is going to come back to a granting agency and say, "I spent all your money and I didn't discover anything of consequence." Again, people digging late sites aren't likely to bust on their implied promises, but the early man business is a much riskier game and like gold-mining there are going to be a lot of non-productive tests. I think this psychological trap has led a number of scholars into pushing their evidence for somewhat more that it is worth, or at the least from having more faith in their evidence than a non-involved reviewer is likely to have. The early man literature in California does not show a lot of self-doubt on the part of the authors.

I don't really have in my own mind any set of "good guys" and "bad guys" in this research and I don't want to rebut specific individuals and sites. I would comment that Early Man archeology (like archeology in general) has gone beyond the point of being a game that anyone can play without training, knowledge, or a great deal of intellectual effort. Too many claims are made in the press and elsewhere by people who simply lack credibility as scholars. I am also personally very resentful of people who are scholars in one area and assume this qualifies them also as professional archeologists. I don't consider myself a chemist and I resent chemists who think they are archeologists. In other words, chiropractors, rock-hounds, arrowhead collectors, and semi-literates, get out! Either invest the time to know what professional scholars in the field know, or give up whining about closed-mind scientists who won't listen to you.

Finally, I think it is highly likely that there are some sites in California that are 20 or 30,000 years old. I even think I know what a couple of them are. However, a lot more work is needed to establish their validity, and what I think I know is not the same thing as what I know I know. So I fall back on the standard conclusion that more work is needed. Known sites presumed to be early in the CDCA should be investigated in detail and either verified or laid to rest. Areas where early sites may be anticipated (lake shore margins, for example) should be intensively and specifically looked at for evidence of early materials. This is not the same thing as sending out a survey crew to pick up pot-sherds and arrowheads.

Because of the controversial nature of such finds and the difficulties of validating evidence, I think it is important that backers of such work

be in sympathy with the notion that negative evidence is valuable and a search that does not find anything is a legitimate piece of work. It would also be desirable to avoid getting such research linked into any of the schools, factions, and personalities associated with early man studies, perhaps by incorporating some non-aligned external reviewers and collaborators.

C. Meighan  
University of California, Los Angeles  
Department of Anthropology  
Los Angeles, Calif. 90024

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I'm not competent on desert archeology, although I have been shown a number of sites in the Anza Borrego Desert State Park and the Yuha Desert. Bob Begole is very knowledgeable about the former, and Morlin Childers the latter. The only site I have studied carefully is the Yuha Pinto Wash complex, 4 IMP 905-906-907. I'm enclosing a copy of a paper I wrote for American Antiquity; they have had it since September - no word on acceptance. I made Morlin senior author because it's really his site. I have the following comments on Sensitivity criteria:

Sensitivity criteria for desert sites are rather different from those in settled areas and areas likely to become settled. They might include:

- A. Importance of the site - is it unique because of scarcity of similar sites, richness of cultural materials, datability, apparent antiquity, cultural stratification, bone in association, etc.?
- B. Accessability of the site - is it in a remote area unlikely to be found and disturbed, near a highway or population center, reachable by wheeled vehicle, etc.?
- C. Fragility of the site - can it be easily damaged, intentionally

or inadvertently, by vehicles, vandals, pot hunters or natural erosion or deposition?

D. Recognizability of the site - does it require a trained person to recognize the artifacts or features, or is it obvious (intaglios, rock art, etc.)?

I would rate the Yuha Pinto Wash sites high in A and B, low in C and D, therefore of Medium Sensitivity. However, if we are dealing with larger areas, I consider the entire Yuha Basin an area of High sensitivity - huge scatter sites covering acres such as Childers' Miller South Site, the Plaster City lake shore and Coyote Wells North, all three representing mid-Wisconsin or earlier cultures.

Begole's sites at Anza Borrego are clearly of Low Sensitivity, at least the Malpais sites between Bow Willow and Carrizo Wash. They are important because very old, but are inaccessible, non-fragile and unrecognizable except by weirdos like us. Since they are in the state park, they are somewhat protected.

You might send a circular to John Alsoszatai-Peteho at Fullerton State College if you haven't already done so. He's doing a survey of the Lake Manix Basin for BLM.

Sorry I can't be more helpful.

Herb Minshall  
4409 New Hampshire St.  
San Diego, Calif. 92116

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We have raw materials from hundreds of sites. They suggest time frames, life-ways separate cultures and peoples. But our knowledge is still vague and minimal. We need to probe, explore, examine, test and analyse far more to answer the following questions;

1. When did man first inhabit the area?
2. What route or routes did they follow?
3. How many separate cultures are identifiable in pre-historic times?
4. What kinds of social organization, food economy, tool technology, spiritual beliefs did they possess?
5. How can they be distinguished from each other?
6. What physical types were present, and how related to Old World?
7. What kinds of climates and environments were present in the area and when?

Herb Minshall  
4409 New Hampshire St.  
San Diego, Calif. 02116

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I would be delighted to assist with your paper for the Pacific Science Congress. I'm sure Morlin will also be pleased to do what he can - he was here yesterday and I showed him your letter. His copy was probably in the mail. I have the following comments:

On tool technologies, I feel sure you must mean macroflake choppers rather than microflake, which seems almost a physical impossibility. The macroflake choppers from the Yuha Pinto Wash and the stream-rolled ones from the highest terrace at Black's Fork, Wyoming, are practically identical, and are almost certainly a combination of bipolar work to produce the large flake or split a cobble, plus hand-held percussion for trimming the edges and imparting the sinuous quality or denticulation. The same thing is found at Buchanan Canyon, where practically every early lithic technique is present, including ridgebacks just like the Yuha specimens.

I think the proper term for the Texas Street industry, if it is an

industry, is bipolar blade and core, since it now appears that anvil-opposed bipolar methods play a part in a variety of different tool forms. I also believe that most, if not all, pre-Wisconsinian people in America were familiar with anvil flaking and splitting, and used it whenever appropriate, as did all later prehistoric Americans.

George Carter apparently believes that separate cultural horizons can be distinguished by the predominance of certain tool types and technologies, blade and core, ovate biface, steeply trimmed uniface, etc.. I'm not so sure - we may just be distinguishing specialized activities of the same people - butchering, bone-smashing, wooden tool-making, leather-working. Thus at Texas Street small blades were needed, so elongate cores are found in fair numbers, but the presence of steeply-trimmed unifacial scrapers doesn't necessarily mean a "La Jolla" cultural horizon there. Numerous elongate cores are concentrated in a small area on an old beachline at Plaster City in the Yuha Desert, but to me this doesn't imply that the makers were contemporary with Texas Street - only that a whole lot of small slicing tools were needed at that location during a period of more humid climate. Of course in more recent times and more refined industries - projectile point characteristics and such can obviously represent distinct and recognizable culture patterns.

I have come to feel distrustful of media demonstrations and believe that they are a waste of time. We are always misquoted, and any publicity is immediately forgotten by almost everyone. Inviting interested observers is certainly useful, but even they tend to separate themselves into those that were already believers and those that no amount of proof will ever convince.

Herb Minshall  
4409 New Hampshire St.  
San Diego, Ca. 92116

In response to your call for information on Paleoamericans in the California desert you will find enclosed a recent reprint and two manuscripts which are to appear in American Antiquity, as well as copies of other material concerning the Yuha Burial (site on BLM land). As you can see I am in the negative camp on this one, however, this skeleton could well be as old as the investigators maintain... it would be premature to dismiss the find.

I hope this will be of use.

Louis A. Payen  
Department of Anthropology  
University of California  
Riverside, Calif. 92521

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The problems of the antiquity of human peoples in the California Desert are the focal point of the debate in the New World. Many of the problems and questions are perhaps irresolvable. Some can be answered by a number of absolute (C-14) dates of cultural remains, preferably bone or charcoal. I would like to address a few of the issues and problems based on first-hand desert experience.

It seems that the burden of proof is on those who proclaim a great antiquity for human presence, over ca 14,000 years B.P.. Proclamations of faith without conclusive proof are all too common. A number of researchers seem content to proclaim early dates for cultural remains (or even natural materials) without reliable and confirmed evidence. It is very easy to do so but most difficult - or impossible - to prove. This is not to say that archaeologists should not keep an open, objective mind on the possibilities, only that they had better be extremely careful of their interpretations. Multiple working hypotheses should be used.

These should be tested and retested before arriving at a cultural construct. If a researcher is looking for early remains, the individual's interpretations of the items is liable to be slanted toward an earlier date. Lack of objectivity, it seems, is a major problem. Notoriety from such claims can enhance one's career but may only damage the advancement of anthropological studies.

Examples of interpretive problems can perhaps clarify my above statements. The problems in dating have seen considerable attention in recent works. The Yuha Burial dating is a good example. Old dates have been derived from CaCO<sub>2</sub> which adhered to the bones and cairn boulders. The soil stratigraphy is not congruent with these dates nor is a new series of unpublished C-14 dates. Interpretation of age/association with an old landform has been found to be untenable, and the skeletal remains appear of a modern type based on published accounts. The answer seems to lie in a dating of the bone itself and similar dating of other regional burials.

The utilization of tool or flake weathering has sometimes been used to express antiquity. Basalt Elko points found by me in Baja California are extremely weathered. A horse intaglio near Pilot Knob in Imperial County contained extremely weathered and varnished flakes and possible flake tools imbedded in the design. Similar remains were found imbedded in the nearby desert pavement. Unless this horse is quite old, based on complimentary paleontological evidence, the possibility that weathering and varnishing of these artifacts are a rapid phenomena must be further explored. Indeed, examination of artifactual materials with pavement needs further study and this site would be a good testing ground.

A similar problem relates to the identification of alleged early tools in certain desert regions, such as the Yuha and other portions of the greater Colorado Desert. It is my opinion that many of these items are in fact ventifacts, created by the saltation of sand particles on pebbles and cobbles periodically exposed and buried. Examples of these include some of the "ridgeback tools" recovered. Some of these collections include what appear to be a mixture of real artifacts and ventifacts. A gradation of forms is present. Certainly further studies of the processes of ventifact formation in the Colorado Desert is necessary, including the effects of saltating particles on confirmed artifacts such as projectile points, elongate bifaces and the like.

Part of the problem above revolves around the identification of time-sensitive artifacts and features. No definitive study of non-projectile point flaked stone materials had really been made and far too much reliance is placed on Malcolm Roger's works. His scheme has simply not been adequately tested. Projections by Julian Hayden of a new Malpais culture into the California Desert based on work in the Sierra Pinacate in Mexico need to be tested. In fact, some of the materials I believe he would term Malpais may well be natural.

Differences in tool kit variability does not seem to be a consideration in assigning ages and cultures to sites. This, too, needs study. I do not want to address the important question of "nature-facts" versus artifacts other than to say studies by Louis A. Payen and others suggest that many items called artifacts by various workers may not be so.

Another obvious and well discussed interpretive error regarding early (or purported early) sites relates to landform association. The

fact that cultural remains are situated on or near older landforms, such as lake terraces, alluvial fans with well-developed pavement and soil profiles, or other features does not insure contemporaneity. In a dialogue between G.I. Smith and myself concerning cultural remains in Searles Valley we may have an example of what I am talking about. Dr. Smith, in discussing artifacts found by Mr. and Mrs. Winslow in Searles Valley has stated the following in a letter to BLM (Nov. 11, 1976):

"At least some of them were found lying on the surface in an area of dark colored, boulder-rich gravels of pre-Wisconsin age that crop out west of a small playa (elev. 1,939 ft) about 4km SSW of the Pinnacles. Presumably, the tools were originally incorporated in younger, finer grained deposits that have been eroded away during subsequent lacustrine periods, leaving them as part of the lag-gravel. As I remember them, the tools were mostly large hand-axe types, made of felsitic volcanic rock from the northern Lava Mountain that are included in the gravels of that area, crudely worked (both unifacial and bifacial, I think) and visibly patinated. On the basis of the patination that characterized dated deposits of alluvium and lake gravels, I would guess that the tools have been lying on that surface for the last 10,000 years. No points or imported rock (e.g. obsidian) were found with them."

The above statement suggests that artifact morphology (crudeness), patination and geomorphic placement are indications of antiquity. This may be so. But then again this may not be the case. In examining the apparent same tools I have seen unpatinated and patinated materials

which seem to be the result of quarry activity (i.e. bifaces, blanks or rejects). If these materials had been washed out by lacustrine events why weren't they water worn? Cultural materials can be found scattered all over the valley at different elevations. Well, I hope I have made my point concerning the care needed before jumping to conclusions on the antiquity of cultural materials.

In summary, I believe that scientific inquiry requires a cautious, conservative approach, being objective, not dogmatic, as perhaps some individuals can be labeled at both extremes of the issue.

Eric W. Ritter  
Bureau of Land Management  
3610 Central Avenue Suite 402  
Riverside, Calif. 92507

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Your letter for help on California Desert archeology comes as a surprise. On several occasions BLM contract workers have come here or we have gone to them and marked huge maps showing sensitive areas, indicating the various kinds of sites. We have combined archeology and paleontology. We have told them where surveys were needed...etc., etc..

As a member of the Advisory Committee and representing cultural resources, we had a two day symposium for Staff and Public as well as us a couple of months ago and our maps were around then so I know they have them.

I could suggest grim things like going to the incomplete but rather useful bibliography Mortland and Binam put together a few years ago, but it is lacking up-to-date information and on early stuff. Instead, I suggest you grab Herb Minshall's book and use it and its super bibliography to the hilt. I am sure you are going to people like Minshall,

Bada, Childers, George Carter, Clements, etc.. I am sure also that you have talked with Eric Ritter who is culture resource man for the desert planning staff.

Of course the thing that makes me cry bitter tears is that so little ground is actually being covered by the inventory work being done... usually less than 1%. Even 10% is a poverty level.

In my opinion every Paleo-Indian and Early Man Site or District should be protected simply because we know so little. Of course, this comes into instant conflict with all other major users who want the desert left open for ORV and mining or closed for special uses... power lines, wilderness, agriculture, grazing, etc.. One of the worst words in this project is allocation.

I know there will have to be trade-offs and concessions. I fear cultural resources and wildlife (plant and animal) will be the losers. Maybe the Native American is in the worst position because his traditional use areas have little of visual significance.

But back specifically to early sites. One of the first questions for us on the Committee and Staff will involve the relationship of archeology to proposed wilderness. Here I take a stand that many do not like: if we are lucky enough to get wilderness status for an area, I would be delighted if there are significant sites in it. These would be protected as a sort of data bank for the day when new techniques are available. However, I do think that areas which may become wilderness should have a careful and fairly complete (50% at least) on-foot survey. No digging, just recording surface evidence. That would be a permitted compatible use of wilderness.

Of far greater concern to me will be areas left open, even to ORV use of roads and trails. That "trails" thing gets those guys everywhere.

Without on-site resident guards (impossible in most cases), how can sites or districts be protected? Protected status has little meaning without enforcement. Clem Meighan and I see this very differently. He, I believe, favors digging sites, getting the data and forgetting them. I want to see the sites intact, especially the old ones about whose culture, way of life, ecology, etc. we know so little. To me, integrity of the sites is vital.

I do not know an answer, let alone The answer to the question of protection and enforcement. Without that answer, the Plan, even if perfect (which it cannot be) will be valueless.

One of the major concerns I have is that once areas are closed to ORVs and other destructive uses, those closed areas will have to show on maps. That will attract people. Perhaps sites should be encompassed by enclosures which are fenced and signed to measure the damage done to plants by grazing. These would serve a double purpose.

While known sites are a problem, I think they will be spoken to in the Plan, and probably a goodly number of significant sites will be protected. If Congress OKs that is something else again. To me a factor of much greater concern is the site potential. That is why I am so sorry the inventory work has covered such a small fraction of the region involved. This does not effect historical material which is documented, but it surely hits archeology and paleontology. Again, the wilderness areas are in fair shape. If there are good sites, an inventory will ultimately find them...maybe we will not know about it, but that is not really important. The sites would be in a data bank and that is what

counts.

Outside the wilderness areas, unknown sites are an endangered species. People think that because they are not known they will not be disturbed. That is dumb. Rockhounds know sites we do not, sites are being ripped off continually because the wrong people know about them. ORVs in open areas can reach any resource. Remoteness is no longer protection. Again, I do not have the answer or an answer... at least not one that would be acceptable.

In my book, every site is highly sensitive...a non-renewable fragile resource. I know in my heart that that view will not fly. It will not be possible in the Plan, nor in the eyes of Congress. I feel sure that Eric and his workers will give us a hatful of prime trails, petroglyphs, campsites, etc.. I hope we will be working together on his hatful and I know many sites will have to be ignored, but there we will be dealing with sites which represent occupations we know a good deal about. When it comes to Paleo-Indian and Early Man sites and potential areas, we are looking at a different ballgame.

I think both of those elements need to be looked at on a case-by-case basis. If material is diagnostic enough to know it is an early site, that site is of high sensitivity. It and its integrity must be protected. I like to think in terms of districts. If there are several sites reasonably close together, I will pull for district status, or if our sensitive areas can be tied in with paleontological or natural history sensitive areas, that would be great too.

What makes an early site sensitive: 1) they are still few in number;

2) diversity; 3)debitage in knapping stations is technically valuable; 4) potential for inter-disciplinary study 5) need for integrity to assist in dating; 6) environmental-ecological setting; 7) potential for sub-surface deposit. These and lots of less spectacular factors make a site of early vintage important.

What are potentially sensitive areas? Any that relate to Pleistocene water courses for one thing. The out back areas which relate to the ancient lakes are of new importance. Shorelines, river terraces, etc.. Areas near sources of lithic material or near potential Pleistocene game migration routes. Paleontological and archeological sensitive areas could well be tied together.

Your map is really not very helpful. So much of it needs to be marked sensitive. By the way, I assume you have contacted John Kelly for data on the Greater Lake Dale area east of 29 Palms. He would be a super contact and one the others may have missed.

I don't have any publications you would not have, but I can say that the new Pleistocene Man at Calico will be available soon. It has gone to press at last!

Guess that is about it...not very helpful, I guess. Ask more questions if I can do more. Good luck.

Ruth D. Simpson  
San Bernardino County Museum  
2024 Orange Tree Lane  
Redlands, California 92373

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This letter is in response to your inquiry concerning an opinion as to the antiquity of human occupation in California in general and the

California Desert Conservation Area in particular. What follows should be jointly credited to Louis Payen and myself. He is completing a dissertation which is directly involved in this question. By the way, I spell my name Ervin and thus Erv - your spelling of Irven is absolutely unique...vanity, vanity. But to the statement --

"There seems to be good evidence of human occupation in California back to about 10,000 to 15,000 years ago, i.e. to the terminal Pleistocene/early Holocene. At about 15,000 years, we feel that quality of the evidence for "Early Man" in California begins to pale and become rather problematical. At last count, the number of California localities with published reports of human skeletal remains or alleged artifact materials of proposed early Holocene or Pleistocene age sits at twenty-nine. It is interesting to discover that, with only one documented exception, where human skeletal materials have been recovered in contexts inferred to be Pleistocene, no cultural materials have been found in association. On the other hand, where there is the presence of alleged "cultural materials" (mostly chipped lithics) with proposed Pleistocene affiliations, there is no evidence of human skeletal materials.

The single exception is the Yuha Burial within the boundaries of the California Desert Conservation Area. In this case, one does have a skeleton and cultural associations with proposed dating at about 22,000 years B.P.. In recent articles in American Antiquity, evidence has been presented by the writers and Philip Wilke arguing for a Holocene age for the burial, perhaps as much as about 5,000 years B.P..

The Pleistocene age assignment for skeletal materials in California has relied greatly on direct radiocarbon or aspartic acid racemization

values in the 17,000 to 70,000 year range. Because of the current problems inherent in the application of both methods to bone, several workers have expressed reservations for the values obtained. However, as a result of work now in progress, we should be able to resolve at least some of the questions within the next two or three years.

With regard to chipped lithics with assigned ages in the 100,000 year and above range (e.g. Calico and Texas Street), a detailed examination of materials from many of these sites using a technique originally pioneered in the Old World suggests that they cannot be distinguished from naturally-fractured lithics. Non-quantitative morphological criteria should no longer constitute acceptable evidence to support the suggestion that these samples are artifacts.

At present (early 1979), our view would be that there is insufficient evidence available to make definite judgements on any site locality in California with a proposed age assignment in excess of about 15,000 years. For such sites, the evidence is either highly incomplete, the artifact status questionable, or the dating evidence uncertain. We would suggest that adequate evidence has been presented for Arlington Springs, Santa Rosa Island (ca. 10,000 years), Mostin (ca. 10,000 years), Diablo Canyon (ca. 9,000 years) and Rancho La Brea (ca. 9,000 years). Evidence on the Laguna, Los Angeles, San Diego, and Sunnyvale materials should be clarified within the next two or three years, as should the age and nature of the chipped lithic materials recovered from the Wooley Mammoth Site on Santa Rosa Island.

In our view, those who are currently certain of the age assignment or artifact characteristics of California sites in the 15,000 years range and up have not carefully considered all of the evidence (R.E.

Taylor and Louis A. Payen).

I hope that this statement will be helpful. Please let us know  
if you have any questions on the text of the statement. Best regards.

R.E. Taylor  
Director, Radiocarbon Laboratory  
University of California, Riverside  
Riverside, California 92521

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The enclosed map emphasized the major PaleoAmerican archeological sites and districts in Imperial County, with two districts about which I am familiar in southeastern Riverside and southeastern San Diego counties. The sensitivity rating for all of them is high because:

- 1) The sites (Pinto Wash I and Pinto Wash II) and the districts (all the others) contain data significant to scientific study.
- 2) To qualify as significant something must signify something else, i.e., it must possess quality and value of an extrinsic nature rather than a possessory one peculiar to itself. Again, factors of quality and value must be present in sites or districts with which relationships can be established in the frames of inter or intra cultural contexts. The mapped areas do that.

By quality I do not mean an evaluative factor but a diagnostic one which is used to describe rather than to assess man-resultant acts, as in technology or style.

By value I mean the character which something assumes by becoming an object of interest, or attention.

It is clear that significant, quality, and value are all dependant upon the completion of the identification process of objects and features. Until the identification process is completed assessments are suppositions at best, and indeed this prematurity has resulted in the major controversies over the study of Early Man in southern California. And without the completion of the process assessments cannot assuredly be assigned the observed artifacts, sites, or districts.

Yet, until the identification process is complete every artifact, site, and district does possess a high rating of significance because each contains those qualities, values, and traits by which the identification process can be completed. Just because we lack the sophisticated mental, laboratory, or field equipment, technique, or method for completing the process at this time is no excuse for writing-off any site as insignificant. Here, I mean that as strong a case needs to be made for a negative as for a positive assessment. The identification process can be only partially completed if the quality of an object has severely suffered by erosive agents, or the value of an object has been reduced through a loss of integrity. But most of what has been assigned to low-significance levels, I fear, is attributable to the failure of the investigator to complete the identification process rather than to the interest-objects themselves.

The identification process must satisfy the questions about content, form, style, and function. Content gets at the measureable and material qualities of the object; form its idea; style its shape, line and mass; function its psychological, physical, intended, and actual usage. I believe

that many investigators immediately get into trouble here because their scientific orientation is directed towards the analysis of objects or interests that had been formulated by people without the benefit of that same mental construct. Scientists depend upon one-to-one relationships that can work forwards from a proposition to a product, and backwards through analysis from the product to the proposition. We are not well-equipped in science to discover relationships which were formed by non-logic frames or along non-sequential steps.

I do not mean to be cold-fish by this, nor am I attempting to cast a wet-blanket over the many competent peoples working in the field. I do mean that our assessments must be cautiously derived and should contain the honest element of whether we are fully confident of the processes by which we arrived at them. The high-frequency with which the word "suggests" has appeared routinely in archeological reporting these days points to a neo-conservativism within the profession. We do need innovative thought, but certainly tempered with thoughtful caution. I am against reckless jabs as well as preconceived opposition to innovation, as now in full bloom between those who claim PaleoIndians were here in the Pleistocene and those who claim he simply was not. Heizer's pegging as "crazy" those who believe in early horizons dominates his assessment of current research, and is a case in point. He has not studied our area, and indeed let the editors doing the Southwest and the Great Basin volumes simply absorb into their own books the entire presentation of the California desert region. I think that he willingly did this out of fear of not finding a competent writer who would agree with his post-Pleistocene bias. What the other editors do will be a

reflection on their work, not his.

My own view is that you cannot explain the demography of PaleoAmericans within Holocene ecologic frames. Paleoclimatology, etc., will assuredly persuade the doubters of the Pleistocene case in due time, and with scientific data. The few studies which have been done -- as in your China Lake project -- must encourage others of the need as well as to provide the base for not writing about ancient man as though he were insanely attempting to survive in areas that today are totally devoid of sustaining resources. He was not dumb. Why are we?

You also asked for reprints and other data. I'll put some things together for you and send them along in a week or so, though you probably need them right now. With the short notice, however, I'll go out of my way to do whatever I can; it will just take a bit of time.

If you want boundaries for the districts and sites I've indicated on the general map, let me know. Also, do you want bibliographies, or have you compiled such lists already? I also know that you haven't time to answer such letters or questions when there is so much writing to do on the report. I only want to do whatever will be most useful to you, and need some direction to prevent duplication.

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Jay von Werlhof  
1507 Vine Street  
El Centro, Calif. 92243

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My feeling on this subject is rather conservative. I believe that when one gives the evidence a critical evaluation, the evidence for occupation of this area prior to about 12,000 years ago becomes very slim.

In about every instance, considering only those in which there is a complete understanding that the objects in question are tools and that they are firmly dated, the sites fall after 12,000 and usually a good deal after. Dates of earlier finds are usually subject to the questions of whether the tools are really tools or some naturally manufactured objects that look like tools, or whether the dating is accurate. Some of the sites where C-14 dates are available in seeming association (stratigraphically) with artifacts are probably not culturally associated with the assemblages they are intended to date. Right now, and I do change my impression from time to time, I do not accept anything as firmly established prior to about 12,000 years ago, although some finds are suggestive. I suggest that you write to Sam Payen, my address, in this regard, as he has been going over a lot of data for the last several years in preparation for his dissertation.

Dr. Philip J. Wilke  
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Sorry about the delay. I hope it hasn't been too long. Actually, the journal has murdered me again this quarter and everything is behind schedule. And I am not sure I have much to offer over what you have outlined on the map. Nelson Leonard was making noises about fluted points from some site at Blackwater Well in San Bernardino County; I do not know the location. A sub-surface site from the sound of his blurb. He is now County Archeologist for San Bernardino County. You might be able

to check with him by phone at the Planning Department in San Bernardino County Government. I do not have the phone number. Palen-Ford is good. Palen at least should have been fresh at some time when it overflowed into Ford and the overflow level should be surveyed. I have wanted to do that for some time. I would also suggest the entire overflow channel from Soda-Silver Lakes down into Death Valley, especially the area of Silurian Lake. I have never heard of anything from there, but the situation is right for freshwater which is what the abs would have gone for. Likewise the overflow from Owens (Pluvial) Lake down through Rose Valley to Little Lake. Some of that country is easy to follow and see where the former river and accompanying marshes would have been. I hope this helps. I hope some day to spend some time on the early man situation in the California Desert, but for the time being, it is the later time frame for me because of other commitments.

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USER'S CARD

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Human activities and  
California Desert.

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